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Contents

PAGE

Editorials:
The Standard Oil Decision 991
The Anaconda Report 991
Compulsory Baths for Colliers 992
Gasolene Motors for Mines 992
Correspondence and Discussion:
The Cuyuna Iron Range....Coöperation in Research Work....Accidents in Mines....Colorado School of Mines Trustees....American Institute....Tonopah Mining Company Report....New Lake Ore Dock....Bonus and Contract Work....Cyaniding Manganiferous Ore 993
Tonopah Belmont Report 995
American Institute of Mining Engineers 995
The New Benoni Mill 996
Chino Copper Company 996
Dome Mines Company, Porcupine 996
Zinc Mining in Nevada 996
Details of Practical Mining:
*A Safety Crane Hook....Method of Shaft Plumbing....Concentration at Morenci....*Bucket Trolley for Shaft Sinking....*Cleaning Drill Holes....*Draining with Well Points....*A New Filter Frame....*A Small Coke Oven....Developing Ore Reserves 997
Nevada Hills Surface Equipment.
J. B. Fleming 1001
Anaconda Copper Mining Company 1003
The Ore Deposits at Porcupine.
Thayer Lindsley 1005
Alaska United Report 1006
*The Monell Slime Table 1007
Colorado Producing Cadmium 1007
The Rare Metals in Peru.
Eduardo Higginson 1007
Scrubber Water Clarifying.
W. Petersen 1007
*The Wabana Iron Mines.
Bruton Symons 1008
*Greenwood Copper Smelting Works.
J. E. McAllister 1011
Mineral Production of Germany 1015
The Pilares Mine at Nacozari 1016
Use of Quartz in Tube Mills.
A. G. Quartano 1017
*Pneumatic Agitation ..... *Oskar Nagel* 1018
Pancoast Disaster Verdict 1019
Handling Explosives Underground 1019
Fortunes Lost in Welsh Collieries 1020
Tests with Explosives 1022
Lignite Deposits in the United States.
Joseph A. Holmes 1023
Anthracite Mine Fire 1023
Smelting Conditions in Utah 1024
Minnesota Iron Notes 1024
Personal, Obituary and Societies 1025
Editorial Correspondence 1026
Mining News 1028
Markets 1034

**Illustrated.*

The Engineering and Mining Journal

MAY 20, 1911.

The Standard Oil Decision

The great event of the last week was the handing down of a decision in the Standard Oil case by the Supreme Court on May 15, this being the first action in the great monopoly cases upon which attention has been concentrated during nearly two years. The previous decision of the lower court was affirmed substantially and the dissolution of the Standard Oil Company of New Jersey was ordered, six months being allowed for that operation. In so far the decision was a complete victory for the Government.

Recognizing the supreme importance of a judicial interpretation of the Sherman Act, however, the Court in its decision went at length into the principles of its prohibitions, and in its constructions the managers of modern business enterprises find comfort and guidance as to what they may legally do and what they may not do.

The matter is so extraordinarily complex that it is hardly possible to sum it up with brevity and at the same time with accuracy. But insofar as it can be briefly generalized, the decision of the Court seems to be that the mere consolidation of companies, or the organization of a big company, is not illegal, not even if it creates a monopoly. The Court holds that it is necessary to distinguish between "reasonable" and "unreasonable" restraint of trade. In other words, a concern which establishes and maintains a monopoly by unfair practices may be guilty of unreasonable restraint of trade and thus illegal and subject to dissolution, as has been decreed in the case of the Standard Oil Company, but a concern whereof no unlawful conspiracy or monopoly can be proved is immune. Thus there is a drawing of a line between good and bad trusts. Every case must be judged upon its own merits.

We must await a careful legal analysis of the decision before we can deduce what constructive organization may now be possible, but without doubt there is a distinct feeling of relief in that the way has been illuminated. As to the great metallurgical companies there is probably now no ground for action against such as the United States Steel Corporation or the American Smelting and Refining Company. Certainly all of the copper companies are as innocent as new-born babes. But as to the possibility of effecting a larger copper consolidation, a subject that is in many minds, it is not certain whether the way can be devised. No doubt that old project will receive much attention.

The Anaconda Report

The Anaconda report for 1910 is of particular interest as being the first of the consolidated company, which now comprises the majority of the mines at Butte and smelts the ore of all the other producing companies except the relatively small amount that is reduced at the East Butte works. The total copper production of the Anaconda furnaces in 1910 was 266,608,461 lb., of which 223,808,546 lb. was derived from Anaconda ore. The total cost of production was $27,127,044, or 10.17c. per lb. This figure is arrived at by dividing the sum of mining, transportation, smelting and refining costs, plus ore purchases, by the total number of pounds of copper produced, which method disregards the gold and silver commonly figured as a credit on copper cost. If we credit the miscellaneous receipts (from subsidiary companies, etc.) the cost of the Anaconda copper in 1910 was about 9.9c. We lack the corresponding figures for 1909 but we think that 1910 shows a material improvement, in spite of the fact that there was a curtailed production while development work was carried on at an undiminished rate. The report shows indeed that the enormous amount of 33.1 miles of development work was done in 1910. Incidentally it is gratifying to note that "a very heavy tonnage of ore in excess of the amount extracted has been added to the ore reserves."

In the Anaconda reports we have the feeling always that the representation of costs is the real thing, i.e., that all exploratory, development and construction work is charged right up to operating expense, so that when the latter be deducted we have the whole thing, without any perplexities of "deferred charges," etc. Consequently there is no lurking suspicion that things look good just because the management is running on new tires.

According to its report for 1910 the Anaconda apparently failed to earn its dividends ($6,930,000 paid) by about $1,209,098. A closer examination, however, reveals that this is largely a result of conservatism in bookkeeping. The accounts show that the company had a great deal more copper on hand at the end of 1910 than at the beginning, and that the unsold metal is inventoried at the cost of production. Quantities are not stated, but we guess that the increase in stock may have been about 40,000,000 lb. If that had been sold at the average receipt for 1910, which probably was in the neighborhood of 12.65c., the deficit would have been practically canceled. The actual result will depend, of course, upon the price at which this copper is actually sold.

We wish that the company had dwelled more extensively upon the results that are being accomplished by the consolidation. Perhaps it prefers to await the record of a longer period. It is evident, however, that some important economies have already been effected, and 1911 will probably show a further reduction in the cost of producing copper. Mr. Thayer says in fact that "the benefits of consolidation so far as costs were concerned were not felt during the first half of the year and in the last six months the profits of the company on a reduced production were $4,214,013, showing a marked improvement in economy of operation for the last period."

Compulsory Baths for Colliers

There is considerable discussion in England with reference to the compulsory provision of baths at collieries for the use of miners. The new coal-mines bill that has just been presented in the House of Commons contains provision for making bath houses and facilities for drying clothes at each colliery compulsory on owners; the bill also specifies that the use of the baths is obligatory on the part of the miners, and it is further specified that the miners are to pay 2c. a week per head toward the expenses of maintenance.

It is doubtful whether the advocates of a compulsory bath for miners in England are pursuing a proper course. There are many inherited traditions among miners, and especially the European collier. Habits thus acquired become deep-rooted, and must be reckoned with. There is a universal prejudice among coal miners against washing their backs, which practice they believe to be weakening. To correct such a personal habit by compulsion through the enforcement of a law is not always the best plan.

It is generally advisable to educate the men first, and if compulsory obligations are imposed, have the miners themselves draft and submit the demands. In numerous instances, operators have been surprised to find their men opposing regulations that would, without doubt, have greatly conduced to the comfort and cleanliness of the miners themselves.

It is undeniable that cleanliness is only acquired at the expense of time and money, and miners, especially during the week days, grudge the time required. It is stated by sociologists that the racial vitality of the miners is not decreased by dirt; in fact, we are given statistics to prove that cleanliness is closely associated with a general fall in the birth rate. Nothing will be gained by attempting to force a collection of sturdy miners to take a daily bath. Even if it were possible, it is not desirable to inaugurate such a plan. The problem is one of education, not legislation. Appreciation of the bath will increase with voluntary use, or not at all.

Gasolene Motors for Mines

Gasolene motors have been used for underground haulage in certain mines of Austria and Germany. A few months ago, a small motor was tested in one of the mines of the Rand, and still more recently two motors made by the Milwaukee Locomotive Manufacturing Company were purchased for the Midvalley Coal Company for its mines at Wilburton, Penn.

The gasolene presents many advantages over other motors. There is not the attendant delay for recharging and expensive equipment of high-pressure air pipe necessary for compressed-air motors; there is no danger from "live wires," or necessity of recharging and moving the storage batteries of electric motors.

As regards horse and mule traction, the gasolene motor is superior. The cost of maintenance of animals goes on whether they are working or not and such cost is not affected by the tonnage of ore moved, whether it be great or small. The maintenance of a stable underground is not only expensive, but it pollutes the atmosphere and gives rise to a disagreeable odor. The breathing of the animals alone introduces a greater amount of carbon dioxide into the air than does a motor capable of doing the same amount of work, the data so far determined showing that one motor is equivalent to 15 mules.

The Midvale locomotives use naphtha as it is less dangerous and easier to handle than gasolene. The exhaust takes place through a series of parallel perforated pipes submerged in a solution of calcium chloride which removes all odor from the exhaust and reduces the temperature to 100 deg. F. or below. It is stated that the mine inspector could detect no odor such as is produced by automobiles.

The gasolene motor should materially reduce the cost of underground haulage, especially in the smaller mines, the output of which is too small to warrant mule traction and where all the tramming is done by men. Furthermore, such motors may effect the solution of the hauling problem where increased mill capacity taxes the tramming of ore through an inadequate system of haulage drifts.

According to the statement of Chairman Gary at the recent annual meeting, the United States Steel Corporation, notwithstanding its large additions to manufacturing capacity, has not quite kept pace with the growth of independent interests. It is now making about 50 per cent. of the finished steel output of the country, against 60 per cent. three years ago. Judge Gary is inclined to take a hopeful view of the situation, and says that the Corporation has done and is doing a very large business, though not as great as was promised a year ago. He admits that manufacturing capacity has been increased beyond present needs, but thinks it will not take long for the country to grow up to the possible supply.

Correspondence and Discussion

The Cuyuna Iron Range

In the JOURNAL of April 8, a brief report by a correspondent was published about the progress of developments in the Cuyuna iron-ore district, to which report Mr. Neimeyer, who is a fee owner and prospector in the district, took exception in an article published two weeks later.

I have been in close touch with developments in the Cuyuna district since drilling was started there, and in my opinion the matters set forth in both the communications referred to above are largely correct; nevertheless, the vital point appears vaguely expressed. It is true, my attention has frequently been called in professional circles to the pessimistic attitude taken by Duluth correspondents for the different mining papers, journals and special supplements, most of which articles are probably prepared by the same few writers. Many readers therefore get the impression that the Cuyuna ores are worthless.

Thus far the Cuyuna district has by no means proved an expensive ground for exploration, neither has the district suffered from wild-cat exploration schemes as has been common on the older ranges. Throughout there has been a notable lack of litigation, and a friendly spirit has always existed between the more important prospectors. During the short period of its existence the district has made rapid progress, even in the overshadowing light of the older ranges and the prejudices of the older mining men.

The improper presentation of the situation is due to the lack of consideration of the intrinsic value of the ores themselves. Most people know iron ore and iron-ore values only when the ore is of bessemer grade, all other ores are disregarded, hence the optimism and favoritism on the one hand, even if the former is more expensive and more hazardous to secure, and the pessimistic attitude on the other hand, even if the latter is more easily available.

The bulk of the Cuyuna ores is not of bessemer grade, and even though some ore of such grade may eventually be shipped, the district will probably never be seriously considered as a field for such ores. But the days of bessemer ore are rapidly waning, and as the furnace practices will eventually have to be modified to meet the changes in the raw product produced, the Cuyuna ores will receive more serious consideration. It seems advisable that ore dealers and furnace men even now prepare themselves for such conditions and carefully consider the Cuyuna ores, for they have many excellent qualities which investigation and a little experimentation is bound to reveal, and untimately a strong and steady demand will be created for them.

The high prices now demanded by some fee owners will probably not prevail long and a more reasonable rate of royalty will naturally be established in course of time. Some such royalties exist even now. The water problem is not so serious as it has been described or anticipated by many, and mining costs can easily be kept fairly low even though the ores must be removed by underground operations. By the time the ores are produced regularly, the iron-ore market will likely be back to that stage where a greater and more satisfactory margin than at present will remain for the operator.

CARL ZAPFFE.

Brainerd, Minn., May 9, 1911.

Views, Suggestions and Experiences of Readers

Co-operation in Research Work

In the JOURNAL of April 15, Raymond C. Benner, of the University of Arizona, makes a plea to engineers engaged in practical work in the field to coöperate with men engaged in scientific and research work in various colleges. It would be interesting to have Mr. Benner state more explicitly what it is that he desires, as I, for one, fail to see what advantage would come to the practical engineer from college research work.

As a rule, such work is done under what may be called classical conditions and is of too general a nature to be of much practical use, for in this generation, when mining and metallurgical problems are to be solved, some individual or company expects to profit very materially upon finding a solution of a problem and ordinarily where there is immediate promise of monetary reward a company can afford to and will spend much more money than could a college.

That a scientific man has at his disposal chemicals and apparatus not likely to be within the reach of those in practice is not entirely true. If any mine is confronted by a hard problem, unless it is but a small property, ample means and facilities for solving such problems are provided by the directors and if necessary such work can be placed in charge of men with highly specialized training and experience in that particular line.

In answer to Mr. Benner's second contention, that the scientific investigator has as his associates specialists in allied subjects, I would say that the average practising engineer has among his acquaintances specialists whom he may call upon in consultation and whose business it is to solve certain phases of problems and being a specialist is more or less constantly pursuing his line in particular cases so that his experience is much broader and more specific than is the college man's. Then, again, in working out a problem for a particular mine, the investigating engineer is more likely to be able to employ and pay for specialist's services.

The spirit of investigation surrounding a worker in a university laboratory would be an incentive to exertion. But would not the inducements held forth to the engineer in the field be far greater?

The gist of the matter is that most engineering and metallurgical problems are special cases and the general problems are too few. Coöperation is desirable but the sphere of the university is largely educational and the solution of economic problems of mining and metallurgy should properly be left to the practising engineers whose business and livelihood depend upon just such investigations as Mr. Benner proposes should be done by a college, which, to a large extent, is an eleemosynary institution.

B. F.

Denver, Colo., May 15, 1911.

Accidents in Mines

That the miner's calling is dangerous, no one will deny, especially when the rate of mortality through accident in proportion to the number of persons employed, is considered. A large number of these accidents can be prevented, but others are difficult to solve as to their immediate cause, and frequently the investigations made result in imperfect and unsatisfactory conclusions.

As far as the sanitary conditions of our mines are concerned, they compare favorably with any other industry; the miner lives on an average a longer life than many city people. Probably part of this may be due to their constitutions when commencing to work. But when we turn our attention to accidents in mines, there is no comparison.

Any calling with an annual mortality of 1 per 1000 persons employed may be deemed hazardous. Yet when statistics in the mines inspectors' reports, etc., are examined, it is found that the average mortality is much higher than this, even

in countries where every possible precaution is taken to avoid accidents, and where the miners are all able to understand the language prevailing, and read the mining laws and rules laid down for each district or mine; but when one compares these countries with the mine accidents in the United States there is a great difference. For instance, the present mortality in our mines may be considered at about 3 per 1000 persons employed. Fortunately the percentage of accidents is gradually decreasing.

No doubt this reduction is mainly due to the fact that mining operations are now carried on by men educated to their respective duties, and the workings are laid out upon a well organized and scientific principle; in fact, mining may now well be considered a profession, and it is to men of intelligence, educated in this profession, that we must look for the future safety of our mines and miners.

In most States mine officials are compelled to go through a difficult course of training before being qualified for such positions, and I fail to see why shot firers should not also go through a thorough course of training; then, I have reason to believe, a large number of our accidents will be prevented.

I will go further to say that the ordinary miner himself should (if he has any interest in his occupation) make the best of his opportunities, in reading mining literature, attending mining schools, or joining some correspondence school upon subjects pertaining to mining. For, if it is intended that mining should produce the best results, if mining enterprises are to pay, and if the preservation of life and property are to be better cared for, it is absolutely essential that miners and mine officials should possess technical education, and a knowledge of the principles of science, which would guide practical men in efficiently discharging their duties, with a minimum amount of labor, and be the means of improving their positions.

T. G. NASH.

Alderson, Okla., May 6, 1911.

Colorado School of Mines Trustees

Everyone interested in the growth and development of the School of Mines of Colorado, is gratified at the recent appointment by Governor Shafroth, of Frederick Steinhauer, Franklin P. Guiterman and William J. Bennett as trustees. It is the consensus of opinion that radical changes in the methods pursued in the past will follow. The methods adopted in the administration of school affairs and the mingling in politics of leaders of the school have given rise to censure. One point of criticism on which action has already been taken, is the construction of the buildings recently erected. Mr. Steinhauer was the choice of the Alumni association, and Mr. Bennett is a resident of Golden, a retired mining man, but not a graduate engineer. Mr. Guiterman is a graduate of Columbia and is manager in Colorado for the American Smelting and Refining Company. The hold-over trustees are Frank Buckley, of Denver, a mining engineer, and James T. Smith.

J. M. BIRD.

Denver, Colo., May 12, 1911.

American Institute

I note a movement in Peru to invite the American Institute of Mining Engineers to visit that country. As a member of the Institute, it would seem to me that it would be much more desirable for the Institute to visit Peru than to make the jaunt to Japan. No doubt, the trip to Japan would be interesting and of some benefit to those who are able to avail themselves of it, but for practical and commercial advantage I think the Peruvian trip would be much more desirable. The Peruvian field is very interesting. At the present time a number of important works are accessible and are in control of American engineers and companies. The field is an inviting one, and the visit of the engineers to this country would probably lead to important and extensive American investments in addition to those already there, and this incidentally would furnish employment for members of the Institute and the trip would be of direct advantage, as well as of great interest. As a member of the Institute I suggest that the matter of the Peruvian trip be discussed.

ENGINEER.

New York, May 8, 1911.

Tonopah Mining Company Report

In the JOURNAL of May 6, 1911, I notice a condensed report of the Tonopah Mining Company, of Nevada, for the year ended Feb. 28, 1911, in which the milling costs were given as $3.177.

The milling costs for the year were $2.94. The figures given in the JOURNAL were the costs for the previous year. The average cost per ton to mine and mill the ore and market the products for the fiscal year 1910-1911 was as follows: Mining costs, $3.95; milling costs, $2.94; metal losses in milling, $1.82; freight on ore milled, $0.63; marketing mill products, $0.73; total costs per ton, $10.07; profit per ton, $11.91; average gross value of ore milled, $21.98.

A. R. PARSONS.

Tonopah, Nev., May 11, 1911.

New Lake Ore Dock

An interesting piece of dock construction is in progress at Allouez, Mich., for the Great Northern Railroad. The construction work is being rushed and it is hoped that the dock will be completed on time—Aug. 1. Although generally known as the "steel ore dock," the amount of timber used in the dock and the approaches will total close to 1,500,000 ft. The cost is expected to reach $1,000,000, and the capacity will exceed that of any of the other three docks, notwithstanding that it is shorter than the smallest of the others. This is due to the type of construction. The dock will be 1800 ft. long, 40 ft. wide and 72 ft. above low-water mark. There will be 302 pockets, 151 on each side, and each pocket is expected to hold about 500 tons of ore. This will make the total storage capacity about 150,000 tons. Including the approach, which will be 300 ft. long, there will be used in the construction, in addition to the timber already mentioned, 10,000 tons of steel, and 32,000 cubic yards of concrete. Electrical power will be used to operate the pockets.

ROBERT ATKINS.

Duluth, Minn., May 13, 1911.

Bonus and Contract Work

In an editorial in the JOURNAL of March 11, on shaft sinking and crosscutting, some remarks were made with regard to the advantages of doing work either on contract, or by offering a bonus for the footage driven. I desire to call attention to the fact that, under the conditions existing in those camps where the Western Federation of Miners has control, contract work is done on a one-sided basis, since the union requires that a company shall guarantee to the contractor that he will earn at least $3.50 per day, the stipulated union wages. Of course, with ambitious men, contracting does bring about an increased individual efficiency, which is advantageous both to the man and the company; but with a poor class of labor, there is actually little advantage, if any, and sometimes a disadvantage, in doing work on contract.

ALLAN C. MORTON.

Butte, Mont., May 5, 1911.

Cyaniding Manganiferous Ore

In the JOURNAL of March 25, "Chileno" asks, from some reader who has had experience, if manganese has any effect as a cyanicide in cyaniding ores. Some years ago I was at the Annie Laurie mine, at Kimberly, Utah, and although the ore contained considerable quantities of manganese no difficulty was experienced, and the consumption of cyanide was quite normal.

I have also conducted experiments on the consumption of cyanide by pyrolusite, and find that little is dissolved by a 1 per cent. solution of cyanide, and less is dissolved in weaker solutions. So I would say that the presence of pyrolusite would be practically no hindrance in the cyanidation of gold and silver ores.

ALEXANDER F. REID.

Glasgow, Scotland, April 8, 1911.

Tonopah Belmont Report

Operations for the fiscal year ended Feb. 28, 1911, according to the annual report of the Tonopah Belmont Development Company, resulted in the production of 36,115 oz. of gold and 3,527,075 oz. of silver from the sale of which $2,272,024 was derived after deduction of treatment charges on ore sent to smelters.

The total quantity of material mined was 97,304 tons, of which 59,159 tons was ore sent to the mill, 21,907 tons was ore sent to the smelters and the rest was waste. The average gross value of the milling ore was $27.58; that of the smelting ore $54.76. The average value of all ore was $34.93. The cost of mining was $6.14 per ton. In milling 89.4 per cent. of the valuable contents of the ore were recovered, and the cost was $4.08 per ton of ore milled.

The reserves in the Belmont vein consist of 260,324 tons of positive ore (blocked out on three or four sides, or upon two sides and faults known to bound the deposit) and 182,174 tons of probable ore. This estimate does not exhaust the probabilities of developing more ore. In developing 7853 ft. of drifting was done, but such work was hindered by inadequate supply of compressed air for the machine drills.

During the last year extensive improvements to mine equipment, surface plants and mills were made, which will make it possible to handle ore more economically than heretofore. A new Ingersoll-Rand compressor with a capacity to deliver 400 cu.ft. of free air per minute has been installed, which will provide an adequate supply of air for development work to be done during the next year.

Golden Horseshoe Estates

LONDON CORRESPONDENCE

The report for 1910 of the Golden Horseshoes Estates, recently published, has been awaited with much anxiety by the shareholders, and with much interest by mining engineers and the public, on account of the difference in the estimate of the ore reserves, made during the year by the manager, Jack Sutherland, and Henri Russ, the French inspector general of mines. The directors supported their manager, whose estimate was 33,875 oz. of gold more than Mr. Russ, yet the sequel shows that the latter was more nearly correct in his figures. The recently issued report shows the reserves have decreased since 1908 from 1,065,409 tons to 803,151 tons in 1910; the net profit from £243,000 to £75,000; the grade of ore treated from 13.33 dwt. to 8.8 dwt.; and the estimated grade of ore from 11.89 to 9.55 dwt. The manager explains the reduction by saying, "that the grade developed during the last six months was below the average, and in order to make the estimate an absolutely safe one, I have made a deduction of at least 10 per cent. in value of sections affected by slides, and not fully developed."

The cost per ton—excluding capital and development expenses—was $5.86, compared with $5.52 for 1909. This increase was almost entirely due to the increased price of the water supplied by the Westralian government. The yield per ton was $7.65 for the 257,333 long tons treated, containing 97,630 oz. of fine gold, the extraction being equal to 85 per cent. During the year the dressing plant was increased. The manager is still sanguine, and he feels positive that his estimate of the reserves is an "exceptionally conservative one," and that a "recurrence of last year's disappointments will be practically impossible."

American Institute of Mining Engineers

SAN FRANCISCO CORRESPONDENCE

Plans for the entertainment of members who attend the annual session of the American Institute of Mining Engineers, to be held at San Francisco, Oct. 10 to 17, contemplate especially visits to fields that have been developed since the session of 1899. Twelve years ago the chief interest of the visitors was in copper mining and smelting, then in the second stage of advancement in this State and in comparison with the development of the last 10 years, still an infant industry. In that year gold dredging had attracted small attention, the first recorded output of consequence having been a total of $18,847 for the years 1897-98. Petroleum production and its practical fuel value had made an impression from the fact that the output was steadily increasing, and that the railroads and the bay and river steamers were preparing for the permanent substitution of oil for coal fuel. But in 1899 the possibilities of advancement in gold dredging to an annual output of $7,000,000, and an increase in crude petroleum from less than 3,000,000 to nearly 75,000,000 bbl. per year, were not even a part of the dreams of mining engineers. Today these two industries have advanced, not only in production but in practical operation, to a position that must be attractive to all mining engineers. The constant growth of gold dredging and petroleum drilling has demanded and developed two distinctive classes of engineers who have much that is new to offer their visitors in October. So these fields will be the principal points of interest as arranged by the local executive committee. The visitors are to arrive in San Francisco Oct. 10, and those who make the trip to Japan will sail Oct. 17, returning Dec. 7. The arrangements contemplate that the business sessions of the Institute will be held on Oct. 10-12, and that the remaining days of the week will include visits to the oilfields the dredging regions, and to Mount Tamalpais, the Lick observatory, the University of California and Stanford University, and such other points as may be desired and of especial interest. It is the purpose, if arrangements may be made with the directors of the Bohemian club, to visit Bohemian grove on Oct. 15.

The following chairmen of committees have been named by W. C. Ralston, chairman of the executive committee: Reception, S. B. Christy; finance, M. L. Requa; sessions, F. W. Bradley; entertainment, E. H. Benjamin; press, H. F. Bain.

Copper Range Consolidated

The Copper Range Consolidated Company is a holding corporation, owning 99,659 shares of the Baltic Mining Company, 99,699 shares of the Copper Range Company, 99,335 shares of the Trimountain Mining Company, and through its subsidiaries one-half of the Champion Copper Company, control of the Copper Range Railroad and of the Michigan Smelting Company. In 1910 it sold 42,468,754 lb. of copper at 12.74c. per lb., from which a total profit of $1,737,677 was derived, interest amounted to $6217, and receipts from the Copper Range Railway to $75,168, making a total of $1,819,062. From this general expenses of $48,602 were paid, and $469,603 turned over to the St. Mary's Mineral Land Company, as its share of the Champion earnings, leaving net profits of $1,300,857. From this, and the previous surplus, dividends of $1,537,340 were paid, leaving a net surplus of $641,726. The Copper Range Consolidated Company has $38,433,500 worth of stock outstanding, and has paid $10,756,716 in dividends in the last six years.

The Baltic Mining Company stamped 781,419 tons of rock in 1910, from which 28,067,300 lb. of mineral and 17,549,762 lb. of copper was produced (22.46 lb. copper per ton of rock). Exclusive of taxes, the costs per ton of rock were $1.576, taxes were $0.092 per ton of rock, and total costs per lb. of copper were $0.0832. The waste hoisted amounted to 5.09 per cent. Detailed costs were: Superintendence and labor, $0.861 per ton of rock; rock-house expense, $0.046; hoisting, $0.060; power drills, $0.054; powder and supplies, $0.144; total mining expense, $1.164. Surface labor, including insurance and legal expense, was $0.076; transportation, $0.129; and milling was $0.205 per ton of rock. The Baltic's deepest shaft is 2164 ft. down.

The Champion Copper Company stamped 722,051 tons of rock, recovering 30,508,690 lb. of mineral, and 19,224,174

lb. of copper. The yield of copper per ton of rock treated was 26.62 lb., the cost per ton of rock treated, including taxes, was $1.859, and the cost per lb. of copper was $0.785. The Trimountain Mining Company hoisted 365,521 tons of rock, and stamped 317,299 tons, leaving 13.2 per cent. waste. The rock averaged only 17.95 lb. copper per ton.

The Copper Range Company is itself a holding company, owning 9360 acres of land on the mineral range, 50,000 shares of Champion Copper Company stock, and 26,051 shares Copper Range Railway. The Copper Range Consolidated also has independent holdings of the railroad stock.

The New Benoni Mill

JOHANNESBURG CORRESPONDENCE

A new mill, now under construction on the Rand, will present entirely novel features in ore-treatment methods as far as the Rand is concerned. The plant for the Benoni Consolidated mines was designed by E. J. Way, and embodies the Arbuckle ore-treatment process, the well known Caldecott tables, and some apparatus designed by Mr. Stadler.

There are 55 stamps weighing 2000 lb. built with ferro-concrete foundations and king posts, and steel bins. There are four tube mills, with four dewatering classifiers and four return overflow classifiers for catching sand not reduced to less than 60-mesh, so that the sand contains a minimum of coarser than 60-mesh product. Following the tube mills are 28 shaking tables for amalgamation and two 8-in. centrifugal pumps for elevating the pulp to two sets of classifiers.

The underflow from the classifiers, consisting of the coarsest sand, goes to a Caldecott dewatering table 20 ft. in diameter, and the overflow to Arbuckle dewatering cones 21 ft. in diameter. The thick slime from the underflow is mixed with the sand from the Caldecott table and sent to four mixing agitators 8 ft. deep by 22 ft. in diameter and a strong solution of cyanide is added. The whole product goes to 32 Way-Arbuckle air-lift agitators working in series and the recoverable gold is dissolved in four to five hours instead of the six days, as was required by the treatment in stationary tanks. The agitators can be run in series or parallel and, like Brown tanks, require but little power. The consumption of cyanide is slight, a 0.20 per cent. solution returning 0.19 per cent KCN after six hours' agitation.

The combined sand, slime and gold solution is elevated by two 8-in. centrifugal pumps to Stadler classifiers and the slime overflow goes to the first set of three cones for dewatering; the overflow of thickened slime contains about 27 per cent. moisture. This slime again joins the dewatered sand from the underflow of the Stadler classifiers and goes to four mixing agitators where the pulp is mixed with weak wash solution. The gold-solution overflow goes to filter sumps and thence through 28 extractor boxes to the strong-solution storage sump.

The mixed sand and slime pulp goes to two classifiers in series; the underflow of first to a second set, thence to a 20-ft. Caldecott table and by a belt conveyer to the dump. The overflow goes to the dewatering cones and the slime underfeed with 27 per cent. moisture is delivered on top of the sand, on the conveyer to the dump. In all, 98 per cent. of the wash solution is extracted and the loss of dissolved gold is small. Owing to the process being a continuous and rapid one, it is stated that the initial cost for the plant is 10 per cent. less than the ordinary type of plant.

Chino Copper Company

The Chino Copper Company has published an "interim" report, as of May 1, 1911. The period set by the certificate of organization during which no increase in stock or bond issue could be made expires on June 9, so that the directors are preparing a plan for further financing of the company, said to be the result of the need for a larger concentrator than the one planned (3000 tons). This plan will be made public during the next month.

The mining property now consists of 2652 acres and the mill site and water rights to 7031 acres, besides leases on 640 acres. Ore developed is now stated at 45,238,312 tons of an average assay of 2.3 per cent. copper. Of this amount, about 71 per cent. is stated to be available for steam-shovel extraction. Up to March 1, 150,645 ft. of drilling has been done in 414 holes, of which 318 having a length of 123,393 ft. have been in ore. The average depth of these holes is 382 ft., the average ore thickness 107 ft., and the average thickness of capping, 71 ft.

Seven drills are now being used in development, and the remainder are being used for drilling in preparation for blasting, in connection with stripping operations. But little underground development has been done since the last report, as it is believed that no ore will be mined except by steam shovels for several years. The underground work that was done was on the Santa Rita shaft now 529 ft. deep, partly to explore the surrounding orebodies, and partly to check underground drilling.

The shaft will be used for such pumping as is necessary to drain the steam-shovel pits. Four 90-ton and one 40-ton shovels, and eight locomotives are now being used in the steam-shovel work. Up to March 1, 1911, over six miles of stripping and ore tracks had been constructed, 334,000 cu.yd. of stripping moved, and 134,000 tons of ore mined and placed in stock piles.

Grading for the mill was begun in July, 1910. The main building is complete, and the ore bins and coarse-crushing plant nearly so. It is expected that one mill section will be in commission by the middle of July, and the remaining sections will be put in operation every 45 days thereafter.

A contract has been made to have the concentrates smelted by the American Smelting and Refining Company at its El Paso plant. The Chino company has $162,743 on hand in cash and accounts receivable, and no current indebtedness.

The Dome Mines Company, Porcupine

According to the Boston *News Bureau*, the Dome Mines Company is capitalized in 200,000 shares, of $10 each, which are held by only 10 persons. The property was located by Jack Wilson for W. S. Edwards, of Chicago, who subsequently interested persons connected with the International Nickel Company, especially R. M. Thompson, J. R. de La Mar, S. H. P. Pell and Ambrose Monell. They acquired a 60-per cent. interest, paying therefor $300,000 in cash, and $450,000 in two-year bonds. It is stated that the Dome orebody is about 800 ft. long and 300 ft. wide, and has been proved by diamond drilling to a depth of 619 ft. It is said that a portion of the ore can be extracted by steam-shovel mining.

Zinc Mining in Nevada

SPECIAL CORRESPONDENCE

The Yellow Pine mine, in southern Nevada, is now down to a depth of 700 ft., on a vein dipping about 35 deg. The company is reported to have been doing so well that it is preparing to avoid the 14-mile wagon haul to Jean, a station on the Salt Lake, Los Angeles & San Pedro railway, by building a narrow-gage railroad from that station to the mine. The Potosi mine, in the same district, is at present employing four 10-horse teams in hauling ore to the railroad. The output of the district is wholly going to Joplin, Mo. In 1910 the production of this district was about 5000 tons of ore.

End of Longdale Furnace Company

The Longdale Furnace Company, of Longdale, Va., will blow out its last furnace and go out of business in May. This is the oldest iron furnace in Virginia, the first stack having been the Lucy Selina, a stone charcoal furnace built in 1827. This was rebuilt as a coke stack in 1867 and later remodeled and enlarged; while a second stack was added in 1881. Longdale was the first merchant furnace in the United States to make basic pig.

Details of Practical Mining

This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent of telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

A Safety Crane Hook

One of the interesting exhibits at the American Museum of Safety, at the Engineering Society building in West Thirty-ninth street, New York, is a patented self-closing safety shackle hook for hoisting work. There have been many accidents due to the disengaging of ropes and chains from hooks and shackles, and this device aims at their prevention.

As shown in Fig. 1, *A* represents the attaching member: *B* the hook member.

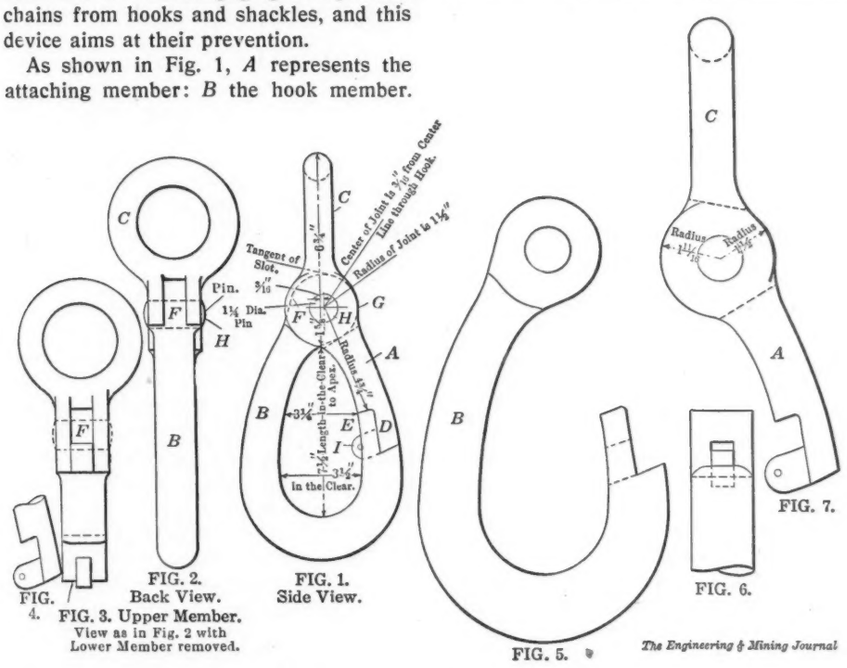


FIG. 1. Side View.

FIG. 2. Back View.

FIG. 3. Upper Member. View as in Fig. 2 with Lower Member removed.

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 7.

The Engineering & Mining Journal

A NEW SAFETY CRANE HOOK

The attaching portion is formed with an eye *C*. A pivot bolt *H* is passed through the attaching member and the hook member to secure the two parts together. This pivot bolt is arranged a little to one side of where the line of load falls on the hook.

When there is a pull simultaneously on the eye and hook, it will force the hook tightly against the guard-finger *D*, and the harder the pull the more the hook member will be sustained by the pressure of the guard-finger against the end of the hook, thus preventing to a considerable degree any chance of straightening out the hook under a heavy load.

From the lower end of the attaching member there is a heavy inward thrust against the lower end of the hook member when a load is applied, which together with lug *E* greatly strengthens the hook. It is claimed that a hook made in this manner, of good material, should be safe, handy and stronger than an ordinary open hook as the stress is transmitted to all parts; that it is useful for all kinds of hoisting work where ordinary hooks are not to be relied upon, and particularly where shackles are used and quick changes are required.

In using shackles sometimes the pin is carelessly or incompletely inserted, sometimes resulting in serious accidents. This danger is obviated by the use of a hook of this kind because as long as the weight is on the hook it cannot open, but for still further security, a cotter pin can be inserted in the hole formed in the lug *I* if desired.

This hook has been indorsed by the leading casualty companies and the American Museum of Safety, after a thorough investigation. It is the invention of F. F. Norden, and is being used and placed on the market by the Foundation Company of New York.

Method of Shaft Plumbing

BY F. L. FISHER*

The following method of carrying a survey accurately down a single vertical shaft is largely used in the Anaconda Copper Mining Company's Boston & Montana mines.

It is best to use copper wire, as any kinks or twists will be drawn out when the plump line is weighted, thus insuring a perpendicular line. The weight and thickness of the wire may vary somewhat though it should be as small as possible, consistent with necessary strength. The wires, two in number, are placed on reels for convenience in handling and the reels are placed at the collar of the shaft above the points where the lines are to be hung.

The base line, or distance between wires, should be as long as possible, to diminish the possibility of error in course; thus a two- or three-compartment shaft is the best for the purpose, as the wires can be hung in separate compartments. In a single-compartment shaft, where the base line is necessarily short, the wires are hung as closely as possible to opposite sides, care being taken that there is no contact with the wall plates or any obstruction in the shaft. The wires are lowered to the desired point, one at a time, and a weight hung upon each.

Two buckets, filled nearly to the top with water, with ½ in. of engine oil on top, are then provided, the purpose of the oil being to prevent dropping water, or sediment, from splashing on the wires and causing vibration. The most suitable bucket for this purpose is made of galvanized iron, 18 in. deep and 10 in. diameter, with a cover composed of two semicircular removable parts, one overlapping the other one inch, and the sides of the bucket ½ in. all around. This cover is made to slope gently up from the sides of the bucket to a central hole 2 in. diameter for the passage of the wire. On the bottom of the bucket a ¼-in. pipe is laid, which runs from the center through the side and up the outside to within 2 in. of the top to allow all water running down the wires in a wet shaft to overflow from the pipe, keeping it at a constant hight in

*Mining engineer, Butte, Mont.

the buckets. The overflow pipe has its initial point at the center of the bottom of the bucket to prevent a current, which would tend to deflect the wire.

The weights are hung upon the wires and placed in the buckets so as to hang clear of the bottom, yet wholly under the layer of oil. A gage, consisting of a small piece of white string or cloth, is then wrapped about the wire at a known distance above the bucket, to prevent the weight from settling to the bottom without the operator's knowledge.

It is found that the wires never come exactly to rest, but for some cause, probably air currents, there is a constant swing which takes the form of an ellipse, so that it is almost impossible to obtain the exact center by lining the transit on the wires.

Therefore, two strips of wood, 1 in. thick and about 2 in. wide, or straight-edges, are placed across the shaft as close to the wires as possible without touching them, and at right angles to the transit. The operator, his eye on line with the two wires, performing the operation on each wire in the same manner, marks off the limit of the swing on the straight edge on both sides. When this is accurately completed, the distance observed is bisected and at the point of bisection a small perpendicular object is erected, such as a pin, as a point to be sighted upon.

The transit is then set up beyond both wires, at a point no farther away than is necessary to obtain a focus, and at a hight approximately on a level with the two pins to be sighted upon, and placed in direct line with them, an operation called jiggling-in, and the angle is turned off in the usual manner.

Concentration at Morenci

The Detroit Copper Mining Company, of Arizona, publishes the following data regarding its 1910 concentrating operations: There were 474,037 tons of ore milled carrying 2.977 per cent. of copper.

The concentrates amounted to 69,907 tons assaying 15.426 per cent. copper, a concentration of 6.78:1, and a recovery of 76.42 per cent. of the copper contents. The tailings assays showed 0.82 per cent. of copper, and the water used amounted to 554 gal. per ton of ore.

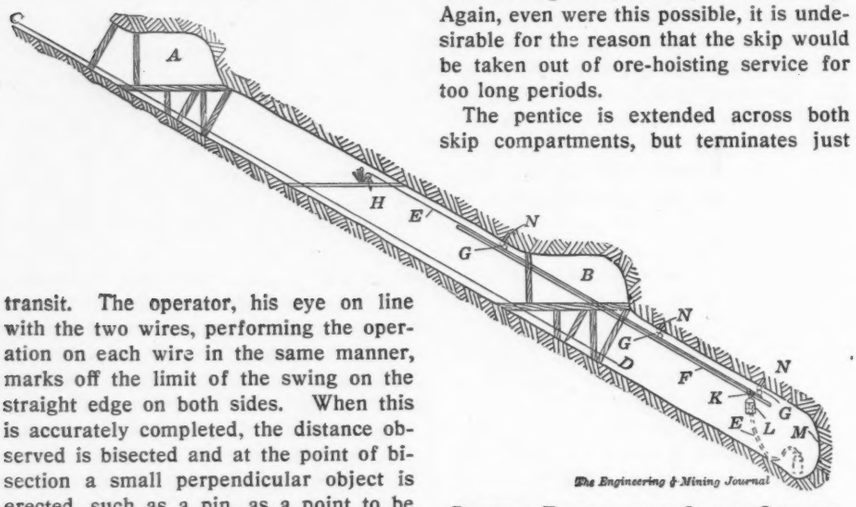
Bucket Trolley for Shaft Sinking

By L. E. Ives*

The problem of maintaining a normal production of ore from a shaft in which sinking is being carried on, is one which constantly confronts the mine superintendent. The accompanying illustration shows a method which is used in the Michigan copper country, at a number of important mines.

The sketch shows a section of an inclined shaft, but does not show details of timbering. *A* and *B* represent the two bottom plats from which ore is being mined and hoisted. Below the bottom plat *B*, and not indicated in the sketch, is a pentice, or bulkhead, which prevents the skip, in case of accident, from descending upon the miners who are engaged in sinking at the working face *M*. While affording protecting to the miners, the pentice at the same time precludes the possibility of loading the muck from the working face, directly into the skip. Again, even were this possible, it is undesirable for the reason that the skip would be taken out of ore-hoisting service for too long periods.

The pentice is extended across both skip compartments, but terminates just short of the ladderway. Thus the necessary protection is afforded, and at the same time the ladderway is left clear. Over the center of the ladderway holes are drilled in the hanging-wall, at the required distances apart. In these holes iron eye-pins *N* are inserted and wedged.



Bucket Trolley for Shaft Sinking

From these eye-pins, by means of chains *G*, is supported an I-beam *F* in such a way that the flat side of the flange is parallel to the hanging-wall and about 10 in. or a foot from it. Along this I-beam runs the trolley *K*. The latter is triangular in form, but the angles vary with the dip of the shaft in which it is used. It is so constructed that when the trolley and bucket are being hoisted, or in other words, when the trolley is running along the I-beam, the bucket is suspended vertically beneath the pulley, which is farthest up the shaft along the I-beam. Only one rope *E* is used and in covering the bucket *L*, when the trolley is stopped by a projection, placed for the purpose at the lower end of the I-beam, the rope continues to lower the bucket to the working bottom, as indicated by the dotted lines. Here the rope is unhooked from the bucket, if desired, and the latter may be moved to any part of the bottom. In hoisting, when the bucket reaches the trolley, the former automatically clamps into the latter and with no delay whatever, trolley and bucket together continue to move upward, until the point for dumping is reached.

In dumping and loading into the skip two methods are in use. In either case the bucket is dumped into a chute. In one case, however, the contents run immediately into a tram car and this, when filled, is pushed around and dumped into the skip, just as ore would be. In the other case, and this is used preferably where only one compartment is being used for hoisting ore, the bucket is dumped into a bin which is built in the unused compartment. The mouth of this bin is so placed that when the latter is full and a skip is available, the gate is opened and the entire contents of the bin are dumped at once into the waiting skip. For hoisting the bucket and trolley an ordinary wire rope is used and a compressed-air hoist *H*, usually called a puffer, is placed on a solar, built for the purpose at point between the two bottom levels. The latter is operated easily by a boy. *C D* indicates the top of the skip rail.

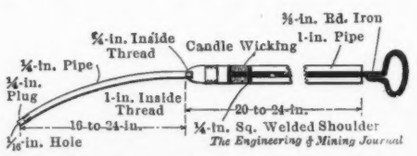
*Mining engineer, 322 Lumber Exchange building, Minneapolis, Minn.

Cleaning Drill Holes

By J. H. Forell*

In drilling upward slanting back holes in dry ground, the drillings are often removed by a squirt gun, an improved form of which is shown in the accompanying illustration.

A piece of 1-in. black pipe, 20 to 24 in. long, is threaded at one end. A cap, slightly cone-shaped at one end, is turned on a lathe and threaded at the large end to fit the 1-in. pipe; the small end is tapped to receive a ¼-in. pipe 16 to 24 in. long. The outer end of the ¼-in. pipe is threaded internally to hold a plug through which passes a 1/16-in. hole. The ¼-in. pipe is curved to enable the operator to introduce it into the hole without danger of being struck by the chuck of the machine. The plunger is made of ⅜-in. round iron and is packed with cot-



Squirt Gun for Cleaning Drill Holes

*Iron River, Mich.

ton candle-wicking held between two shoulders of ¼-in. square iron about 4 in. apart.

The advantage of this squirt gun is in the long, narrow pipe, which can be introduced into the hole a foot or more, giving a greater pressure at the cutting end of the hole, whereas, with the old-style gun the greatest pressure was near the collar.

Draining with Well Points

It is often the case in placing concrete piers, foundations and retaining walls, that there is a heavy influx of drainage water that rapidly fills the pit dug for foundations, or accumulating behind the forms for retaining walls, rises to exert a considerable hydrostatic pressure that may warp the forms either prior to or after filling with concrete.

In laying concrete foundations supported on all sides, the inflowing water is not of much moment as the concrete may be filled in to displace the water, and if there is no heavy upward flow that carries away the fine cement, a substantial foundation is obtained.

But there are many instances when ground water is detrimental to both the stability and facility of making the structure, more particularly in the case of retaining walls. In laying brick or stone masonry in pits, such as elevator pits, the inflow of water must be controlled and usually the desire is to draw the water from back of the wall being built. i.e., between the wall and face of earth which the wall is to support.

The problem of draining, while building a wall that will later be impervious to water, may often be satisfactorily accomplished by using well points, driving them down back of the wall. A number of such points can be attached, preferably by a flexible coupling such as a short length of hose, to a main leading to the suction chamber of a pump.

The well points are made of 1-, 1½- or 2-in. pipe of suitable length, to one end of which a solid iron or steel driving point has been welded. Above the point the pipe is drilled with many small holes for a foot of its length to make a strainer.

In driving the pipes, a steel or iron bar, just a trifle smaller than the diameter of the well point and a foot longer, which at a point about 14 in. from the end has been upset enough to make it a little larger than the pipe, is placed in the pipe, and the point is driven by sledging the upper end of the bar. When the point is driven to the desired depth the bar is withdrawn.

When first used the pump draws considerable sand through the pipe but gradually the gravel and bits of rock too large to pass the strainer form a coarse filter that not only prevents much sand from entering the pipe but gives freer passage for the entering water.

A New Filter Frame*

The filter frame at present being used in Western Australia is shown in the accompanying illustration. The trouble with all the earlier frames was that the cakes cracked on exposure and consequently fell off. Practically all frames are now built of 1-in. steam pipe and are covered with 16-oz. duck, with cocoa matting between.

The filter cloths are sewed with vertical seams 3 in. apart, this spacing having been found to be the best. Undoubtedly a great part of the filtered solution passes through the stitch holes instead of the cloths, and it has been found that bags with seams 6 in. apart do not take cake so quickly as those with 3-in. spacing. Bags with seams 1 in. apart have been tried, but these did not form the cake so quickly as the 3-in., the reason being that the close stitching drew the cloth tight and compressed the cocoa mat so that little space was left for the solution to pass through.

The weight of the pipe, frame and cakes is supported by two beams of special section. The detail of these beams is important. The beam at first used, Fig. 1, had many disadvantages. The wooden cleats were not strong enough to hold the cloth, and the weight of the cake. The cloth also had no support where it joined the beam, thus causing cracks to form there on exposure. It is also obvious that if the cloths were allowed to stretch, the cake would crack at the top. Another difficulty was that the cake formed on the cloth, where it was stretched over the beam and could not afterward be dislodged by the air discharge, thus necessitating constant hand cleanings. The air pressure also caused rapid wear of the cloths, for when the air was turned on a great strain was put on the vertical seams at the top of the bag, and it was only a matter of a few charges before holes appeared, allowing the slime to leak into the filtered solution.

All these disadvantages have been overcome in the improved frame, Fig. 2. In this frame the support of the cloth is satisfactory, as it is clamped securely in the split beam. No cloth is exposed on the outside of the beams, consequently no cake can form on it. The shape of the edge *A* is designed so that it just presses on the cloth, but not so tightly as to prevent the passage of compressed air. The vertical seams come just up to this ledge, and it is, therefore, impossible for them to rip.

Frames are now usually made of a uniform size, Fig. 3, 9 ft. wide by 4 ft. 9 in. deep; this permits the use of a covering of duck, 72 in. wide. The capacity of the plant is adjusted, not by the size, but by the number of the frames employed. Taking into account the handling of the frames for renewal, and the time occupied in filling and discharging the filter vats, this size of frame has been proved, from practical experience, to be the most efficient; deeper frames take considerably longer to discharge, owing to the choking of the cakes.

If a plant is working on slime that will form a cake less than 1½ in. thick, piping of smaller size than 1 in. may be

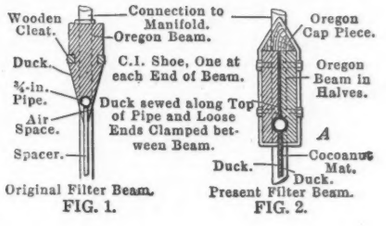
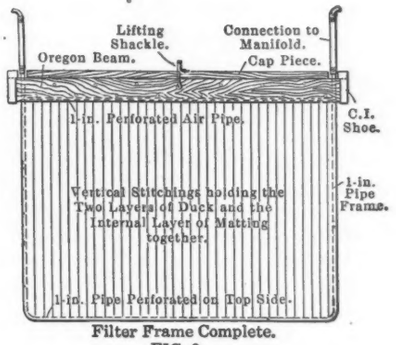
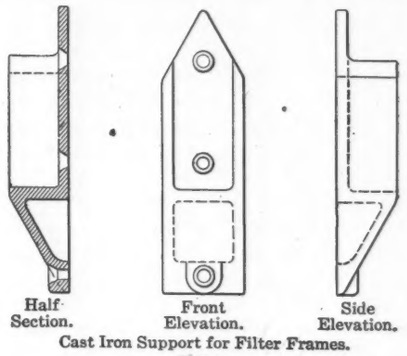


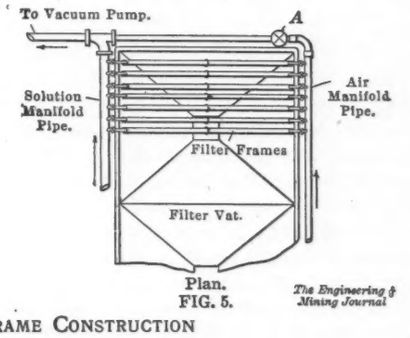
FIG. 1.

FIG. 2.


Lifting Shackle.
Connection to Manifold.
Oregon Beam.
Cap Piece.
1-in. Perforated Air Pipe.
C.I. Shoe.
Vertical Stitchings holding the Two Layers of Duck and the Internal Layer of Matting together.
1-in. Pipe Frame.
1-in. Pipe Perforated on Top Side.
Filter Frame Complete.
FIG. 3.



Cast Iron Support for Filter Frames.
FIG. 4.



Plan.
FIG. 5.

The Engineering & Mining Journal

DETAILS OF FILTER-FRAME CONSTRUCTION

*Excerpt from an article in the *Monthly Journal* of the Chamber of Mines, of Western Australia.

used for building the frame; but with cakes above this weight nothing less than 1-in. pipe will stand the shock of the falling cakes. Pipes are liable to break where they join the beam, owing to the leverage exerted on them when the falling cakes spread the frames at the bottom. It is advisable not to fix the frames in the filter vat too securely, as a slight motion of the beams decreases the shock to the frame. Figs. 2, 3 and 4 show the latest design for holding the frames in position. The cast-iron shoes are securely bolted to the frames and have a good footing in the cast-iron sockets bolted to the filter-vat side. This arrangement allows for slight rocking of the frame; it will withstand considerable wear and tear, and the frames will always hang plumb.

Various devices have been tried for obtaining the necessary spaces for the flow of the solution between the cloths of the frame. Wooden laths were first used, one being placed between each 3-in. seam; these were fairly satisfactory, but they did not give the support to the cloth that the cocoa mat did, and the cakes were, therefore, more liable to crack during exposure. Ripple iron, i.e., galvanized iron with small corrugations, as used at the Waihi mine, New Zealand, was also tried, but as this had to be used without vertical seams, trouble was experienced in discharging the cakes; when the air was turned on the cake was stretched, but not discharged.

Forming the Slime Cake

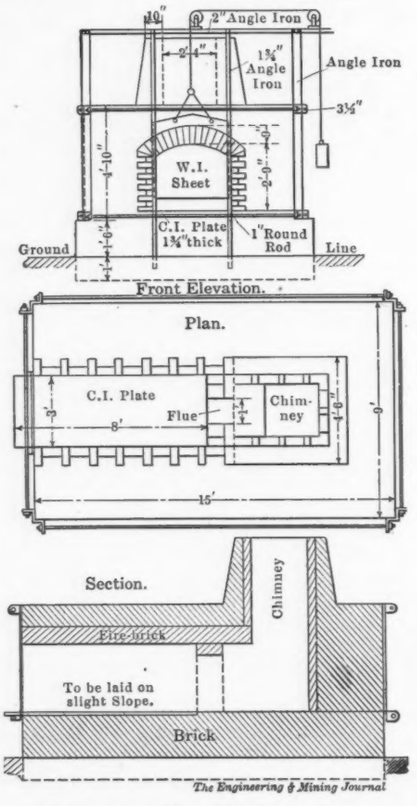
With very free-filtering slime, i.e., slime that will form a cake of 2 in. or more in 20 min., it has been found that the cakes formed thicker at the bottom than the top. The reason for this has been traced to the fact that the filter mat is not sufficiently porous to allow the solution to be drawn off as quickly as it passes through the cloth. This difficulty has been obviated by using the top pipe of the frame, as well as the bottom one, for drawing off the solution. This method is illustrated in Fig. 5, which may be described briefly as follows: In taking cake or washing, both the solution and air cocks on the frame, as well as the valve *A*, are left open, thus enabling each cock to draw from approximately half a frame. When the cakes are ready to discharge, valve *A* and the air valves on the frame are closed; compressed air is then admitted to the other end of the air manifold, and the air cocks are opened one at a time to discharge the cakes. The same result could be obtained by using larger pipes for the frames and a larger solution manifold, but this would add needless weight to the frames. This arrangement is also useful as an addition to an old plant, where, by reason of the internal deposition of lime, the pipes become too small for the flow of solution.

A Small Coke Oven

In the report for 1909 of the chief inspector of mines in India there is described a small oven for making soft coke, the details of which are shown in the accompanying illustration.

The 1⅜-in. cast-iron sole-plate should be made in two pieces, each 4x3 ft. The object of the plate is to retain the heat after the charge has been started, so as to raise the unburnt coal quickly, as it is turned over in the oven, to a comparatively high temperature. The rest of the sketch is self-explanatory.

Coal of about 1½-in. cubes is best suited to the production of soft coke by this oven, but it should be remembered that only coals which will fuse can be used successfully. Carbonization is facilitated by gently lifting the charge every 15 minutes or so to admit air into the interior of the charge by means of a pricker or pointed long iron bar, and should be complete in from 6 to 8 hours, according to the volume of volatile matter to be driven off.



Oven for Making Soft Coke

If the oven is to be used for the production of hard coke, it should not be forgotten that the last traces of volatile matter must be expelled; if soft coke is to be produced the charge must be withdrawn before the last traces are driven off. Out of 100 tons of coal it is possible to get from 65 to 70 tons of soft coke by the use of this oven.

Developing Ore Reserves

Special Correspondence

The Modderfontein B is one of the large developing mines on the Rand which will shortly be equipped with a mill to crush 30,000 tons of ore per month.

The consulting engineer foresaw the possibility of finding irregular occurrence of the gold in the vein, so advised development on broad lines. The ground near the central shaft was known to be low grade, and in order to reduce the costs per ton of ore developed, it was decided to make 800x1000-ft. blocks.

The vein dips from 10 to 15 deg. and has been developed to a depth of 2000 ft. on the dip and 7000 ft. along the strike, resulting in the blocking out of 2,788,000 tons of 7-dwt. ore over a width of 48 in. Haulage drifts were cut in the footwall.

In stating the value of such large blocks of ore, the figures are, of course, approximate, for samples from the periphery may indicate pay ore in blocks, which when cut into smaller parts will be found to contain ground that will not be profitable to work and the converse will be true of other blocks, the samples from which will indicate unprofitable ore.

The advantages of a preliminary blocking out on a large scale are at once apparent to the manager of a mine wherein the gold occurrence is erratic. He may so direct the cutting of the larger into smaller blocks preparatory for stoping in such order as to secure a more uniform supply of ore for the mill and having so much larger area to work from, it is much easier to draw ore from the different faces to secure a mill supply of about the same average value obtained from the sampling of the large blocks, than would be the case were he to develop the vein by cutting smaller blocks.

In short this method of developing gives a fairly accurate determination of the value as well as quickly developing the maximum tonnage of ore. The data so obtained is much more accurate than could be obtained by diamond drilling, and development charges can be more equitably distributed.

At the laboratory of the Mines Company of America's property at La Colorada, a device for drying pulp and slime samples is installed which is of interest, because of its simplicity and effectiveness. Instead of drying the samples by heat, the moisture is extracted by a vacuum process, employing the principle of the Moore filter. A canvas is stretched across the bottom of a small sample-drying pan, and the vacuum applied at the bottom by a hand pump. The pans are 6 in. across and 2 in. deep.

Nevada Hills Surface Equipment

By J. B. Fleming *

Description of the new mill and other surface improvements at this Nevada silver mine. Ore treatment will comprise stamp crushing, concentration and cyanidation. Plant to be completed in August.

*Mechanical engineer, Fairview, Nev.

In planning for the new mill for the Nevada Hills mine, at Fairview, Nev., careful experiments made on a large scale before the plant was designed, indicated that fine crushing in stamp batteries, table concentration, followed by sliming in tube mills and final cyanidation in connection with continuous pulp thickening, agitation, decantation, dilution, filtration and delivering the final pregnant solution to continuous zinc-dust precipitating presses, would yield the best results in extraction as well as economical operation. With the plan of treatment determined, the most suitable mill site was found to be a west-sloping hillside having an inclination of 17½ deg. and immediately adjoining the lower side of the new three-compartment shaft just being started near the top of the hill, the center line of the mill extending through the center of the shaft. Ground was broken on Sept. 22, 1910, and work has continued without interruption, except for inclement weather.

Hoisting Equipment

The hoisting equipment is as follows: About 100 ft. east and on a level with the collar of the shaft is a Joshua Hendy Iron Works double-drum hoist, operated by a 150-h.p., Type I, Form M, General Electric motor, 600 r.p.m., and equipped with most approved type of control. The drums are 51 in. diam. by 20 in. face and each has a capacity of 2000 ft. of ⅞-in. wire rope. The maximum duty of the hoist will be to raise a total unbalanced load of 8100 lb. in either compartment, at an average speed of 600 ft. per min., made up approximately as follows: 1000 ft. ⅞-in. rope, 1200 lb.; one 40-cu.ft. capacity, self-dumping vertical ore skip with hood and safety-clutch dogs, 2000 lb.; one special forged Norway-iron cage, 900 lb.; 40 cu.ft. of ore, 4000 lb.; total, 8100 lb.

The hoisting ropes are the "Tico special," being the highest grade of hoisting rope made by the Trenton Iron Company, and each has an ultimate strength of 35 tons and a guaranteed safe working load of seven tons. Similar equipment is provided for both compartments of the shaft, and under normal conditions the ore skips will be operated in balance, reducing the power consumption about 40 per cent., or from 150 h.p. to 90 h.p. The hoist is housed in a building 40x50 ft. which will also contain an Ingersoll-Rand two-stage air compressor having a piston displacement of 1350 ft. at 100-lb gage pressure, capable of operating about fifteen, 2¼-in. drills or their equivalent. The compressor will be belt driven by a 200-h.p. G. E. motor.

The machine and blacksmith shop, immediately to the north of the hoist house, is 30x50 ft., equipped with lathe, drill press, shaper, emery wheel, crane, forges, etc., operated by a 10-h.p. G. E. motor. The carpenter shop, located just south of the hoist house, is also 30x50 ft. and will be equipped with the usual wood-working machinery, electrically driven. There is also located in this building, a 25-h.p. electric hoist for operating an inclined tramway extending to the bottom of the mill, used for hoisting concentrates, lowering supplies, etc. Both buildings are connected to the collar of the shaft by means of an 18-in. gage track which passes through the center of each shop for convenience in handling timbers, machine drills, tools, etc.

The New Headframe

The new three-compartment shaft is surmounted with a substantial concrete collar 25 ft. high which also forms the foundation for the front posts of the headframe on one side and of the bin posts on the other. The steel headframe is 77 ft. high, weighs 28 tons, and is equipped with two 84-in. bicycle-type sheave wheels over the two working compartments of the shaft and one 48-in. sheave wheel over the service compartment. Immediately in front of the headframe is a 300-ton bin divided into two compartments, one for ore and one for waste, so arranged that one or both of the two-ton skips can discharge into either compartment as desired. The waste bin is provided with a counterbalanced bottom-gate discharging into a car on the same elevation as the collar of the shaft. The ore bin is discharged through a side gate directly into the crusher. The bins and crusher are covered by a building 32x40 feet.

The transformer house, north of the mill, is 20x30 ft. and is equipped to transform current to the amount of 1000 h.p., if needed, from 6600 volts to 440 volts at the switchboard, from where it is distributed to the various light and power circuits throughout the plant. Current will be furnished by the Pacific Power Company with whom a satisfactory 10-year contract has been made, delivery of current to begin about June 1, 1911.

Mill Building

The mill building, adjoining the waste and ore bin on the lower side, is 308 ft. long by 56 ft. wide on the crushing and concentrating floors, 84 ft. wide on the tube-mill floor, and 112 ft. wide in the cyanide department. There is a total fall of 120 ft. from the crusher floor to the sump floor divided into eight different levels as follows: (1) Crusher and elevator; (2) mill bin and stamp batteries; (3) classifiers and concentrators; (4) tube mills; (5) collecting and thickening tanks; (6) dilution and decanting tanks; (7) treatment tank and filters; (8) heating plant, sumps, etc. The foundations and retaining walls are of reinforced concrete and the building, as are all the others mentioned above, is built of steel throughout, and covered with asbestos-lined corrugated iron, making them easily warmed in the winter and cool in summer, and fireproof. They are further safeguarded by a number of hydrants distributed about the plant which are connected by a pipe line to a 50,000-gal. fire tank placed on a hill southeast of the shaft.

The treatment scheme decided upon, and the machinery contracted for, are as follows: The ore, delivered to the mine ore bin by two 2-ton self-dumping skips in balance, is drawn from the bin over a grizzly into a 20x12-in. Hercules crusher, which can crush enough ore in eight hours to supply the mill for 24 hours; a 12-in. continuous-bucket elevator delivers the ore to the top of the mill, whence it ascends by gravity through an automatic-sampling plant and an automatic-weighing machine into a 600-ton steel-frame ore bin above the stamp batteries. The sampling plant is equipped with a Hercules crusher, a set of rolls, three Vezin samplers, a sample grinder, and a 4-in. belt and bucket elevator to deliver the rejected portion of the sample to the top of the mill where it joins the main stream of ore just before it enters the weighing machine. This automatically weighs and records all ore passing through it each 24 hours.

Stamps Weigh 1250 lb.

From the ore bin the ore is drawn into four Hutchinson feeders, which automatically serve the four 5-stamp batteries of 1250-lb. stamps, which are arranged in two sections of 10 stamps each, separately driven by two 35-h.p. motors, which are belted to cam pulleys, at the center of each 10-stamp battery. The four mortar boxes weigh 12,000 lb. each, and are of the low, heavy-duty type, specially designed and made with narrow

boxes for rapid discharge. Each is securely anchored to a reinforced-concrete foundation by seven 1¾-in. bolts, which are easily removable in case of breakage without interrupting the operation of the battery. The entire battery is designed for heavy duty and provided with chrome-steel fittings; all bolts are of Norway iron.

Crushing through 20-mesh screens is followed by classification and concentration over six No. 2 Deister sand tables and four No. 3 Deister slime tables, tailings discharging to two 45-in. Akins classifiers, overflow to thickening tanks, and sands to two 18x5-ft. tube mills discharging into two 12-in. belt and bucket elevators, delivering to a 36-in. hydraulic classifier from which the overflow goes to the thickening tanks and slimes to four No. 3 Deister slime concentrators for final concentration. The tailings again return to the Akins classifiers, the overflow to thickening tanks and the coarse sands, if any, returned to the tube mills, thus making a closed circuit from which escape is impossible until all the ore is reduced to the proper fineness. Each tube mill is separately driven by a three-bearing 75-h.p. G. E. motor.

The scheme of concentration may be varied to suit the ore without interruption of operation. Inasmuch as concentration, when preceding cyanidation of silver ores, is being abandoned in many cases, it should be stated that there is a large tonnage of oxidized ores containing manganese dioxide so combined with the silver as to make a combination which does not yield to cyanide treatment, and concentration must be adopted to remove this mineral. When the oxidized ores are exhausted, concentration can probably be abandoned.

The Cyanide Plant

From the tube mills the finished product flows to two continuous-thickening tanks 34-ft. diameter with 12-ft. staves, supplied with overflow launders and heavy Dorr thickeners. The thickened pulp flows to a mixing box, where the proper amount of lime water is added, passing on to nine agitation or treatment tanks, 12-ft. diameter with 32-ft. staves, the clear overflow from the thickening tanks being returned by a 6x8-in. Goulds triplex pump to a 50,000-gal. tank situated near the top of the mill. Standardized solution is added in the first treatment tank, the entire number arranged in series for continuous agitation; the ore is under treatment for 42 hours from the time it enters the first tank until it is discharged from the last one in the series. Air for agitation and aëration is supplied by a 13x10-in. duplex, low-pressure, Ingersoll-Rand compressor driven by a 50-h.p. motor. From the last treatment tank the ore passes through three dilution tanks, 34-ft. diameter with 12-ft. staves, supplied with overflow launders and Dorr thickeners, arranged in steps so that the overflow from one tank is discharged into the next one below. Barren solution from the zinc presses is added in the upper tank and thoroughly mixed through it by the action of the Dorr thickener, diluting the solution, 3: 1. The clear overflow discharged into the next tank undergoes the same treatment. This treatment of the ore is automatic and continuous through the three tanks. At the same time the thickened pulp is being automatically drawn off at the bottom and transferred, in the opposite direction, through the three tanks by diaphragm pumps. The ore from the last tank, deprived of about 95 per cent. of its value by this dilution, is discharged into a stock tank 30 ft. diameter with 12-ft. staves, equipped with a Trent agitator.

The rich solution overflowing from the last tank in the series is passed through two 36-in. 40-frame Perrin clarifying presses into three precipitation tanks, 15-ft. diameter with 8-ft. staves, and the necessary amount of zinc dust automatically added by a Merrill zinc-dust feeder. Two 4x6-in. Goulds triplex pumps deliver the rich solution to two Merrill precipitation presses of 300 tons capacity each, located in the refinery building. The barren solution from the precipitation presses flows to two solution tanks, 30-ft. diameter with 10-ft. staves, from which it is drawn off and standardized as needed, in a tank 34-ft. diameter with 12-ft. staves, conveniently located in the mill building.

From the stock tank the pulp flows by gravity to two Oliver continuous filters, 11 ft. 6 in. diameter and 12-ft. face, which discharge the filtered and washed residues continuously to a 14-in. belt-conveyer tailing stacker 200 ft. long, placed at an inclination of 20¾ deg. Vacuum for the filters is maintained by two 14x14-in. Goulds belt-driven vacuum pumps. The machinery for the cyanide plant is driven by a 100-h.p. G. E motor. The mill is heated and the solutions maintained at the proper temperature by two 80-h.p. oil-burning boilers, which also furnish steam to operate an auxiliary electric plant of 100 h.p., to be used to operate mine pumps in case of interruption or temporary suspension of service by the power company.

The Refinery

The refinery building, 28x70 ft., is situated at the top of the hill and on the same elevation as the shaft collar. It is of fireproof construction throughout and contains: Two 52-in. by 16-frame Merrill presses; four Faber du Faur melting furnaces; one fireproof vault; one platform scale; four steam-drying cars, together with the usual equipment required for preparing five tons of silver bullion for market per month. The concentrates produced will be reground in a 5-ft. continuous-grinding pan, amalgamated and discharged alternately into two filter-bottom tanks 6x20x3 ft. each, thence to a steam dryer, then sacked for shipment.

Water for milling operations will be furnished from the mine by two 4½x8-in. Goulds triplex pumps, each having a capacity of 100 gal. per min. against a 1000-ft. head, and direct connected to 40-h.p. G. E. motors. These are now on the ground and one is installed on the eighth level of the mine.

Machinery and equipment is being furnished by the following firms: Electric hoist and mill machinery, Joshua Hendy Iron Works; cyanide tanks, Pacific Tank and Pipe Company; zinc-dust precipitating equipment, Merrill Metallurgical Company; continuous filters, Oliver Continuous Filter Company; electrical machinery, General Electric Company; air compressors, Ingersoll-Rand Company; pumps, Goulds Manufacturing Company; lumber, Booth-Kelly Lumber Company; cement, Colorado Portland Cement Company; hardware, Pacific Hardware and Steel Company; structural steel for all buildings and headframe, James J. Burke & Co. All supplies are being forwarded from Fallon, Nev., by Walker & Gillson.

Construction work is advancing rapidly and it is expected the plant will be entirely completed early in August, 1911. The estimated cost of the entire surface equipment is $300,000, which includes an office building, boarding house, four bunk houses and a store house, all substantially built, comfortably furnished and conveniently located.

Mount Boppy Gold Mine

London Correspondence

Mount Boppy is the premier gold mine in New South Wales, although not more than 600 ft. deep, yet the reserves are estimated at 234,684 tons, ample to keep the mill running at its full present capacity for three years. It has increased the reserves during the year 9000 tons; it treated 78,690 tons during the year for a yield of 31,486 fine oz., showing a monetary increase over 1909 of £11,600. The grade of ore treated was 8 dwt. and the costs 20s. per ton. This mine has sold nearly £987,000 worth of gold and has paid to its fortunate shareholders during the last eight years £400,000, more than three times its capital, equal to 40 per cent. per annum, free of income tax; and yet it hopes to do much better in the coming years, as the capacity is to be increased by the addition of ball mills and its efficiency by the installation of the vacuum swstem, at an estimated cost of £12,000, with anticipations that £16,000 additional gold will be saved annually.

Anaconda Copper Mining Company

Annual report gives details of operations in Butte mines under new conditions of consolidated management. Full economies not yet realized. Year's profits $5,720,903, of which $4,214,013 was earned in last six months.

The report of the Anaconda Copper Mining Company for the year 1910 is the first since the consolidation of a number of Butte properties with the Anaconda company. The authorized stock was increased from 1,200,000 shares to 6,000,000 shares ($25 par), and 3,020,000 shares were given for the properties of the Boston & Montana Consolidated Copper and Silver Mining Company, Red Metal Mining Company, Washoe Copper Company, Butte & Boston Consolidated Mining Company, Big Blackfoot Lumber Company, Trenton Mining and Development Company, Parrot Silver and Copper Company, Alice Gold and Silver Mining Company, and the stock of the Diamond Coal and Coke Company. On April 1, 1910, the Anaconda company began operating them as departments.

The Original Consolidated Mining Company and the Clark Montana Realty Company owned a large number of mining properties, of which the largest were the Original and West Stewart mines, the ores from which were reduced at the Colusa-Parrot Mining and Smelting Company's smeltery. These properties, with the exception of some town lots in Butte and a few claims in which the predominating metal was zinc, were bought by the Amalgamated Copper Company as agent, and on June 1, the Anaconda company assumed the management of them, closing the smeltery and leased it to W. A. Clark for the treatment of zinc ores.

Mining operations are conducted under four departments: Anaconda; Boston & Montana; Butte & Boston and Parrot.

Anaconda Department

No ore was hoisted through the Anaconda shaft in 1910, as it was under repair. Some ore was mined from the lower levels of the mine, and was hoisted through the St. Lawrence and Never Sweat shafts. The fire caused but little annoyance.

The Never Sweat shaft is now down 2500 ft., and the usual amount of development work was carried on. The levels were extended westerly to the crosscuts from the Parrot shaft, and the ores from the easterly end of the Parrot ground, together with the ores from the Never Sweat mine, will be handled through this shaft.

The St. Lawrence shaft has attained a depth of 2100 ft., and the ore supply is being mined from the 500-, 600-, 700-, 800-, 1000-, 1400-, 1600- and 1800-ft. levels. On Sept. 23 the ore bins which had served this mine for many years and which were beyond repair, collapsed, and advantage was taken of the compulsory shutdown thoroughly to repair the shaft. New ore bins were built and the shaft will shortly be in operation again. It is the intention of the management to sink this shaft at once to the 2800-ft. level, at which depth a new drainage system is being established for all of the mines of this department.

Ore was mined through the Mountain Consolidated shaft from the 300-, 400-, 800-, 1600-, 1700-, 1800-, 1900-, 2000- and 2200-ft. levels. The developments were most satisfactory, especially on the 2200-ft. level, where the vein was encountered in May, and drifting on the vein disclosed a long continuous shoot of ore. On March 1, the crosscut on the 2800-ft. level of the Diamond shaft was started south to connect with the drainage drift from the High Ore mine.

In the High Ore shaft the crosscut south on the 2800-ft. level, which was driven to a point vertically under the Anaconda shaft, was connected by diamond-drill holes with the bottom of that shaft to form a part of the 2800-ft. drainage system. All of the water developed in the mines operated by the Anaconda and Parrot departments is drained to this shaft.

The Belmont shaft was sunk an additional depth of 550 ft. during the year to a point below the 2200-ft. level in the Anaconda shaft. Stations were cut in the shaft at points corresponding to the 1800-, 2000- and 2200-ft. levels of the Anaconda shaft, and connections have now been established with the 1400-, 1600-, 1800- and 2000-ft. levels of the Anaconda mine.

Work on the Original shaft has been carried on since June 1, 1910, with most gratifying results. Large bodies of high-grade ore were developed on the 2300- and 2400-ft. levels, both in an easterly and westerly direction, and connections are being made with the levels from the Gagnon shaft at several points, it being the intention ultimately to hoist all ores in the vicinity of the Original and Gagnon shafts through the Original shaft, which is equipped with all modern hoisting appliances. At the Moonlight shaft there are practically no changes. The Poulin shaft has been operated throughout the year.

Tramway Mine

The Tramway shaft was sunk 100 ft. in 1910 and is now 2000 ft. deep. A large amount of development work was carried on, resulting in the discovery of new orebodies of great size and carrying high-grade ore. The limits of the orebodies mentioned have not been determined. The supply of ore has been mined from the 1400, 1500, 1600, 1700 and 2000 levels, and from the bottom levels of the Rarus shaft.

No sinking has been done on the Gagnon shaft, but a new three-compartment shaft, located to the westward of the old shaft, has been sunk 740 ft. during the year, to a depth of 1175 ft. Developments on the bottom levels have shown a large tonnage of smelting ore.

Boston & Montana Department

The Mountain View shaft of the Boston & Montana department is three compartments to a depth of 2200 ft., and in addition an auxiliary air shaft, fully equipped, has been sunk to the bottom levels of the mine. The most important developments during the year have been made on the bottom levels. Drifts have been carried on ore during the year 1910, for a distance of 6386 ft. The mine has been equipped with a new office building, change rooms, blacksmith shop and ore bins.

In the Pennsylvania shaft, ore has been mined from the third to the eighteenth level during the year, and a fair tonnage of ore in excess of the amount extracted has been put in reserve. Operations on the Leonard property are carried on through three independent shafts: No. 1 shaft, known as the old shaft, has been thoroughly retimbered during the year; No. 2 shaft, of four compartments to the 1800-ft. level and a new air shaft lying in a northwesterly direction from No. 2 shaft, which is being sunk to the 1300-ft. level. All of the ores are hoisted through No. 2 shaft, which is fully equipped with modern machinery. The ore hoisted has been taken from all of the levels of the mine from the third to the eighteenth level. Developments have been satisfactory generally throughout the mine, but especially so on the 1600 and 1800 levels, where large orebodies of commercial ore have been developed. The water from all of the mines operated by the Boston & Montana department is pumped through shaft No. 1 by electrically driven pumps.

At the West Colusa shaft ore has been mined from the 300-ft. level to the 1800-ft. level. Development work has shown some bodies of ore, remarkable both as to tonnage and value, especially between the 1200 and 1800 levels, adjoining the Tramway orebodies on the west.

The Badger State shaft is now 1800 ft. deep, 283 ft. having been sunk during the year. Stations have been established at the 1300, 1600 and 1800 levels, and several veins of great promise have been developed, showing good widths, and a grade of ore higher in copper and carrying average silver contents greater than that of any of the other mines. There is a general opinion among those familiar with this property and its development that it is destined to become one of the great mines of the district. Development work is being pushed with vigor.

Butte & Boston Department

Connections have been made between the Silver Bow and Berkeley shafts, and the second to the tenth levels have furnished ore. The greatest development in the shape of new ore has been on the 1000-ft. level, where an oreshoot was discovered, and at the end of the year had been drifted upon in continuous ore of good grade for a distance of 780 ft., with every indication of its continuance. An electrically driven pump is being installed on the 1000-ft. level of the Silver Bow shaft, and sinking will be continued in the Berkeley shaft.

ANACONDA BALANCE SHEET, DEC. 31, 1910

Assets

Land and mines	$67,781,508
Buildings and plants	15,039,183
Timber land	5,955,719
Investments	4,301,661
Prepaid insurance	133,092
Supplies for consumption	3,311,251
Supplies for sales	2,059,054
Metals on hand	14,736,503
Accounts receivable and cash	5,402,247
	$118,720,218

Liabilities

Capital stock outstanding	$105,500,000
Capital stock owing	2,812,500
Wages and accounts payable	4,821,448
Unpaid back dividends	6,151
Dividend payable Jan. 18, 1911	2,110,000
Surplus at Dec. 31, 1911	3,470,119
	$118,720,218

A large amount of development work has been carried on in the East and West Gray Rock shafts during the year, with good results. The cost of mining in the properties of the Butte & Boston department has been the lowest in the district. The West Gray Rock shaft was increased from two compartments to three compartments during the year, and ore was mined on all levels from the second to the eleventh.

Parrot Department

The Parrot shaft of the Parrot department has been abandoned so far as hoisting is concerned, and at present is used only as a means of furnishing air to the different workings. The West Stewart shaft, 2300 ft. deep, is fully equipped with modern engines. For several months previous to June, the ores were trammed to the Original shaft and hoisted. This system was continued under the new management until Nov. 1, when the hoisting engine was started, and as soon as possible arrangements were made whereby the ores from the Clear Grit and Little Mina mines were hoisted through the West Stewart shaft, and the Little Mina shaft abandoned.

Development Work

There was done in the mines of the company during the year, in the form of drifts, crosscuts, upraises, winzes and shafts, 33.1 miles of development work, and a heavy tonnage of ore in excess of the amount extracted added to the ore reserves. The shafts of the different properties were sunk during the year to additional depths aggregating 3765 ft. The mines of the company produced during the year 3,326,227 tons of ore and 4413.19 tons of precipitates, or a total of 3,330,640 tons.

Improvements

An extensive compressor plant was installed near the High Ore mine, operated by electric power, which should be in operation early in the year 1911. It is purposed to do all of the hoisting by means of compressed air, generated at this plant, but the experiment will be tested out primarily on three of the largest engines. Reductions in costs will be also attained by the use of electrically driven pumps, and by electric underground haulage.

The centralization of operations so far as hoisting is concerned will be a prominent factor in the future tending toward reductions in costs. Refinements have been made in both reduction departments, and during 1911 a final test should be completed of a centrifugal-concentrating device which promises well. Some satisfactory experiments were carried on during 1910 with a small unit having a capacity of 40 tons per day. It remains to be seen whether the same results can be obtained from a large operating unit, having a daily capacity of 250 tons.

Reduction Works

The reduction works treated for all companies during the year 3,302,523 dry tons of ore and other cupriferous material at Anaconda, and 1,035,165 dry tons of ore and other cupriferous material at Great Falls. Of this amount 3,253,345 tons of ore furnished from the company's mines, 385,200 tons of purchased ore, together with 129.61 tons of precipitates, and 13,668 tons of slimes from the old works, were treated for the company, from which there was produced 167,507,409 lb. of fine copper, 7,107,696 oz. of silver, and 38,564.65 oz. of gold at Anaconda; and 56,301,137 lb. of fine copper, 945,631 oz. of silver, and 6,614.46 oz. of gold at Great Falls; or a total production for the company of 223,808,546 lb. of fine copper, 8,053,327.141 oz. of silver, and 45,179.1192 oz. of gold. The production of the other companies during the year and prior to consolidation at April 1, 1910, amounted to 42,799,915 lb. of copper, 1,481,561 oz. of silver, and 12,080.5 oz. of gold, making a total production at Anaconda and Great Falls for the year of 266,608,461 lb. of copper, 9,534,888 oz. of silver, and 57,259.6 oz. in gold.

Subsidiary Departments

The coal mines at Belt, Mont., produced 160,152 tons of coal; 20,101 tons were shipped to other departments of the company; 122,943 tons were sold and 17,107 tons were used at the coal mines. The mines at Diamondville, Wyo., produced 548,344 tons of coal; 331,924 tons were shipped to other departments of the company, 169,008 tons were sold, and 47,411 tons were used at the coal mines. The mines at Washoe, Mont., produced 120,033 tons of coal; 97,395 tons were shipped to other departments of the company, 17,290 tons were sold, and 5348 tons were used at the mines. The sawmills at Hamilton, Hope, Bonner and St. Regis cut 128,334,239 ft. of lumber, of which 6,487,768 ft. were used at the mills, 105,996,951 ft. were sold commercially, and 15,849,520 ft. went into stock.

ANACONDA COPPER MINING COMPANY'S PROFIT AND LOSS ACCOUNT, 1910

Metals on hand, Jan. 1, 1910		$5,986,964
Metals acquired with purchased properties		7,415,984
Mining, including development		12,628,535
Ore purchased (f.o.b. smeltery)		2,986,488
Freight on domestic ore		975,917
Reduction expenses		7,203,880
Freight, refining and selling metals		3,001,378
Administration and taxes		330,847
Interest		140,230
Net profit		5,720,903
		$46,391,126
Sales of copper, silver and gold	$30,943,508	
Royalties and precipitate sales	54,551	
Income from investments	195,219	
Rental of properties and water rights	57,228	
Miscellaneous receipts	28,102	
Net profits of subsidiaries less depreciation	376,014	
Metals on hand, Jan. 1, 1911	14,736,504	
	$46,391,126	

The Butte, Anaconda & Pacific Railway transported during the year 5,101,187 tons of ore and freight, and 197,240 passengers. The gross earnings were $1,189,716; and rental of tracks and miscellaneous rents $17,533; operating expenses $939,614; taxes, interest, and rental on leased lines $84,613; net income $183,022. A dividend of 6 per cent. on the capital stock was paid, amounting to $60,000, leaving a surplus profit for the year of $123,022. The subsidiary departments of the company show for the year profits of $376,014.

Accompanying tables show a condensed balance sheet and profit and loss account. It is said that the benefits of consolidation were not felt, so far as costs were concerned, until the last half of 1910, and on the last six months the profits were $4,214,013 on a reduced production.

The Ore Deposits at Porcupine

By Thayer Lindsley *

The most important orebodies are the quartz fissure deposits that appear to be fillings and replacements along lines of fracturing, and in which the gold seems to be of secondary origin.

*Mining engineer, 82 Beaver street, New York, N. Y.

The ore deposits at Porcupine may be roughly divided into three classes; the quartz fissures, the ferro dolomite zones and the pyrite-silica impregnations. At present most attention is being paid to the quartz fissures and this article will deal chiefly with that type. The quartz fissure veins occur in schists derived from Keewatin basalts and quartz porphyries, also locally in Huronian sediments, and are found throughout the district as far as present developments show, in certain definite belts. They are irregular in strike and width, often split into two or more parallel leads, and have numerous branches and stringers.

Character of the Quartz Veins

These veins have been formed in a closely spaced zone of fissures wherein the open spaces have been filled and the shattered and fissured country rock has been replaced by quartz. My observations have led me to believe that there were some open spaces in the original fissuring, though a good deal of the vein filling is due to replacement. This replacement in most cases has been so complete as to give every appearance of an open fissure filled by a solid mass of quartz. No instances of crustification were observed, though it may have occurred on a small scale.

The veins as seen on the surface are lenticular, narrowing down at places to mere stringers and then widening out to considerable widths, 10 ft. or more. This is due chiefly to the irregularity of the original fissuring rather than to any complex system of minor faulting.

In the eastern part of the field this irregularity has been extraordinarily developed, forming the so called "domes" of quartz, as seen at the Dome mine, and on a smaller scale at the Dome Extension and eleswhere. On examination these "domes" resolve themselves into networks or stockworks of intertwined quartz veins and stringers, of every conceivable strike and dip, merging together in places to form large masses of solid quartz.

In regard to faulting, it is too early to give an idea of its character and extent, but some curious cases of minor faulting were seen, such as that on the 100-ft. level of the Vipond, where a section of a more or less vertical vein had been overturned and was lying flat. The veins have various dips, usually close to the vertical, and are found lying with, as well as cutting, the laminations of the country rock, which have a general northeast trend.

The individual quartz fissures give slight indication that they can be developed for any considerable length, probably none are over 2000 ft. long. Their strike may be anywhere in the northeast quadrant, but they lie in more or less definite zones which are quite persistent, and traverse the country for several miles. In the ordinary vein type, as opposed to the "domes," considerable ribbon structure or banding of the quartz parallel to one wall has been noted in some veins, indicating successive openings or shattering along the walls. This was well exhibited in the Rea, Vipond and Hollinger mines. At one mine only, the Rea, was anything like a well defined wall seen. There may be other instances but the general cementing and silification that took place after the period of ore deposition has more or less obliterated these planes of movement. At the Rea, a recent movement followed one of these planes.

In the Hollinger veins and some others near Pearl lake, the vein filling has the appearance of having been subjected to long continued shattering, refracturing, reopening and brecciation. This action was probably most intense in pre-Cambrian times, and was followed by a period of quiescence that has continued to the present day, permitting a general silification and cementing of country rock and vein matter to take place. However, in some of the larger veins and especially in the main oreshoots there have been slight recent movements permitting underground waters still to circulate to a small degree.

The Segregated Deposits

Throughout Ontario it is common to run across irregular quartz bodies of the segregated, pegmatite type, possibly connected with a period of Laurentian intrusion, which represent the stumps or roots of ore deposits, the upper portions of which have been removed by erosion. These deposits are characterized by great irregularity and intense hardness and should in no way be correlated with those at Porcupine. According to Doctor Miller, the mineralization here is connected with post-Lower-Huronian granitic intrusives, which occur in extensive fields at no great distance from the camp; a review of the available evidence certainly seems to support his theory.

It is impossible to determine at present from geological relations, how much erosion these deposits have undergone, but a study of the character of the structural features of the fissuring, with the numerous evidences of blocks, slices and fragments of wall rocks found in the veins, tend to show that at the present horizon of the veins the country rock was essentially brittle during the time of ore deposition, and that no great superincumbent load could have existed. In fact, there is reason to believe that these orebodies have not suffered greater erosion of the upper portions than say, for instance, has occurred on most of the Mother Lode veins of California, though, of course, there is no geological relationship whatever between the two districts. It is safe to say that though the quartz lenses may pinch out, disappear or widen out locally, the more important fissures of this camp should extend to fair depths structurally, i.e., 2000 ft. or more.

Mineralization

Glacial erosion has removed practically all evidences of oxidation that may have existed previous to the advent of the glacier and what oxidation has taken place since seldom extends more than a few feet below the surface. What has to follow applies only to the unoxidized zone. Stansfield has shown[1] admirably in a series of slides the minerals and their relationships as found in the veins. These veins are of the normal quartz-pyrite fissure type, and if the pyritic wall rock is excluded from the ore, the sulphides will not average over 2 to 3 per cent.

The gangue consists chiefly of white glistening, opaque quartz. Some calcite occurs in thin films between the quartz grains, and in some cases notable quantities of calcite, dolomite and ankerite are found along the walls. The actual relationships of the carbonates with the quartz may be interesting, but as far as I can see, have no particular economic bearing.

Tourmaline in fine needles is common and is often found in veins of this type and period as well as in those of the early Paleozoic. Stansfield mentions feldspar and considers that its presence indicates a pegmatite analogy of the veins, but this appears doubtful. The other minerals, chlorite, sericite, etc., are undoubtedly alteration products of included fragments of country rock.

The pyrite in the veins occurs as cube crystals, as fine aggregate masses deposited on slices or fragments of included country rock, and also by itself in thin films showing no crystalline structure to the eye, along planes of movement and joints in the quartz. The only way,

[1]*Canadian Min. Journ.*, Feb. 15, 1910.

I can account for the films is that they were originally of iron oxide, and have been altered back to pyrite by a rise of the ground water level; H_2S, of course, being present in the water. Chalcopyrite has been observed, especially at the Rea; also small quantities of fine-grained galena and zincblende, usually denoting richer ore.

Conditions of Gold Occurrence

The gold occurs native in the quartz and on the pyrite, and also as an intergrowth in sulphide crystals. An interesting example of the last was seen at the Dome Extension, where there was a small 4-in. stringer of white quartz carrying large cubic crystals of pyrite. One fragment of quartz when broken, showed a cavity fully ⅜ in. square left by the decomposition of crystals of pyrite and in the bottom was a loose mass of minute fragments of gold.

The gold is found with pyrite along films of country rock, and also occurs in the quartz in a rough sort of banding or streak parallel to a wall, as is seen in the Hollinger and the Rea. At the Vipond, associated with ribbon quartz, some fine specimens have been found showing the gold forming a band of minute particles, so fine as to appear almost as a yellow stain.

Native copper was seen embedded in clear unoxidized quartz at the Rea and a few crystals of what appeared to be tetrahedrite, were seen in a specimen from the McIntyre. All through the district silver is associated with the gold, but in unimportant quantities.

The schist has been impregnated with pyrite and carbonates, and locally considerable silification has taken place. At the Hollinger there are places where this silification is accompanied by gold in quantity to make good-grade ore over fair widths. This gold is undoubtedly of secondary origin.

In consideration of the mode of occurrence of the gold in the veins, of the fact that the unoxidized wall rock is impregnated with gold, that there has been an immense lapse of time since the original ore deposition, and that there are strong evidences of long continued movement in the vein filling, there is reason to believe that the presence of most of the gold is due to secondary action and enrichment, though not in the limited sense as applied to copper. In the larger veins of this district, where the signs of long continued movement and shattering of the vein filling is especially prominent the chances of finding extensive pay shoots are promising.

Comparison with Other Districts

It might be well to draw attention here to the history of districts of similar character elsewhere in the world. It is a curious fact that a close correlation can often be drawn between widely separated districts and a perusal of Lindgen's studies on metallogenetic epochs and Spurr's comparisons of metallographic provinces will open up a line of interesting thought.

The Porcupine gold deposits belong to the general broad class known as the pre-Cambrian. In the lands circling the Indian Ocean we have the greatest development of this type as yet discovered. There are several subdivisions of this class, but Porcupine so far has only developed the normal quartz fissure type.

In Rhodesia the Globe & Phœnix, the Rezende, the Giant and the Lonely Reef occur in the Bulawayo schists and are connected with granitic intrusives. The Globe & Phœnix vein averages about 4 ft. wide down to the 1800-ft. level and still has ore reserves of about 180,000 tons of 35-dwt. ore, with possibilities of considerable extension. The Rezende is down over 500 ft. and has ore reserves of 170,000 tons of 6-dwt. ore. The Giant is down to the 1000-ft. level, and has ore reserves of 300,000 tons of 9-dwt. ore. The Lonely Reef is a new mine, but is opening below the 600-ft. level excellent quantities of 1- to 2-oz. ore.

The mines in the Kolar goldfield have been found to persist to remarkable depths, though there is some question whether the deposits are of the quartz-fissure type. In Western Australia occur these same Archean schists, extensive granitic intrusions and quartz fissure veins. The Great Fingall, down 1800 ft., has produced over $18,000,000, but at present is not looking particularly well at depth. The Sons of Gwalia, close to 2000 ft. deep, has had an excellent record, and at present has reserves of over 500,000 tons of $10 ore. Prestea Block A is a recent venture in West Africa, and also belongs to this type. It is already more than 600 ft. deep and has blocked out 700,000 tons of $11 ore.

Gold Produced from Narrow Veins

The above mentioned mines have large persistent quartz veins. In regard to the innumerable narrow, small veins from which comes a large proportion of the gold produced in these regions, and yet about which we hear so little, as they are chiefly worked by tributors, I am obliged to say that their record with depth has been uniformly bad. Another point to be borne in mind is the fact that in these districts of pre-Cambrian formation, the quartz-fissure type has been so far of minor importance, the chief producers being the mines along impregnated zones.

An interesting geological point in connection with these pre-Cambrian ore deposits is the constant association of diabase and diorite dikes. At the Globe & Phœnix especially, as well as at other mines, they seemed to have exercised a beneficial effect. On the 16th level of this mine a diabase dike was encountered recently, which so enriched the vein that an oreshoot 40 in. wide and over 1000 ft. long has been opened averaging 134 dwt. per ton.

Conclusions

Zones of ferrodolomite probably existing prior to ore deposition have been locally cross fractured, and the seams filled with quartz. The large structural features of these deposits have attracted attention, but they may not have the importance that their size seems to indicate, though this has yet to be proved.

In Deloro township, just south of Tisdale, and around Langmuir, still further to the southeast, there have been reports of strong mineralized zones impregnated with silica and some gold. In view of the good record of this pre-Cambrian type in other parts of the world, it might be well to pay considerable attention to these deposits.

Whether it is safe or not to venture an opinion on the future of the quartz fissure veins at Porcupine, it is reasonable to believe in the light of what has been said previously that in the larger deposits where evidences of secondary action in the vein filling has been strong, there should be found extensive and profitable oreshoots.

Alaska United Report

The Alaska United Gold Mining Company operating the Ready Bullion and 700-ft. Claim mines on Douglas Island, Alaska, paid four dividends during 1910 amounting to $135,150 or 15 per cent. on par value of the stock and $193,360 was written off for depreciation, according to the fifteenth annual report covering operations for the year ended Dec. 31, 1910.

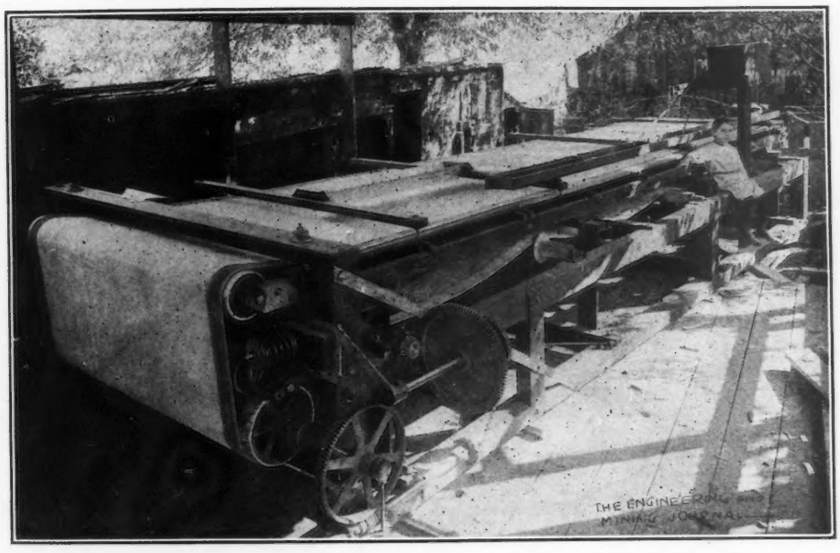
From the Ready Bullion mine 232,330 tons of $2.43 ore was delivered at the crushers at a cost of $1.0271 per ton including development. The cost of milling in the 120-stamp mill was $0.259 per ton. The yield as bullion was $1.2133 and as concentrate $0.8945 per ton. The total cost for treatment was $489,693 or $2.1078 per ton. The amount of $489,693 was realized from sale of products.

From the 700-ft. Claim mine 188,329 tons of $2.44 ore was mined at a cost of $1.2079 per ton. Of this ore 3728 tons was sent to the Alaska-Mexican mill and 435 tons to the Alaska-Treadwell mill. The cost of milling 184,156 tons of ore in the 100-stamp mill was $0.2419 per ton, which yielded $233,150 or $1.226 per ton as bullion and $156,448 or $0.8496 per ton in concentrate.

The reserves in the Ready Bullion mine are estimated at 1,754,350 tons of $3.02 ore, while in the 700-ft. Claim mine the reserve is 865,223 tons of an average value of $2.51 per ton.

The Monell Slime Table

The Monell slime table, shown in an accompanying illustration, is a comparatively new arrival in the concentration field, but possesses some novel and valuable features. The table has a four-ply rubber and canvas belt which runs level longitudinally except for the last few inches near the end roller. The ore is fed on the first 12 ft. of the table, the entire table top being 23 ft. long. The width of the table is five feet, of which three feet on the feed side is level; the two feet on the opposite side has a downward slant. The motion is longitudinal, at the rate of about 180 vibrations per min., which gives a panning motion to the pulp. The concentrates are taken off over the head of the table, while the tailings are washed over the edge. The capacity is claimed to be 10 to 12 tons per day of 24 hours, with one to 1¼ h.p. used. The inclination of the tailings side of the belt can be varied at will.



THE MONELL SLIME TABLE

These tables are in use at the Wolf Tongue mill at Nederland; at Hildreth's mill at Rollinsville; the Zophar Mining and Milling Company, Wall street; the Smith & Ardourel mill, Beaver Creek; and the Tungsten Mines Company, Beaver Creek, all in Colorado. According to a report by the Colorado School of Mines the use of the Monell concentrator has raised the saving of tungsten in the Boulder field by 15 per cent.

Colorado Producing Cadmium

Cadmium has been added to the list of metals produced on a commercial scale in Colorado. Following a series of successful experiments the American Smelting and Refining Company has undertaken the recovery of metallic cadmium from flue dust. Most zinc ore carries a small per cent. of cadmium and is practically the only source of supply.

The Rare Metals in Peru

BY EDUARDO HIGGINSON*

The vanadium mines of Minasagra, in the province of Pasco, belonging to the American Vanadium Company, represented in Lima by Eulogio Fernandini, produce sulphides and oxides of this metal and constitute the principal source of that substance in Peru. There are, furthermore, deposits of asphalt and vanadiferous coal, whose ashes sometimes contain as much as 40 per cent. of vanadic acid. These deposits are found and worked in the provinces of Yauli, Jauja and Canta, among them being found the Lucha mine, in Huari, near Oroya, the property of Alejandro Aza, of Lima. The most recently worked deposits of this class are those in Yautac, between the provinces of Canta and Yauli, where Augusto Gildermeister, Alberto Noriega, Fausto Valdeavellano and Carlos I. Lisson, of Lima, and the Praeli brothers, of Tarma, have different holdings. The coal here contains from 1 to 1½ per cent. of vanadic acid, which is concentrated in its entirety in the ashes. In the provinces of Huancayo and Dos de Mayo, there are several such deposits which are not worked, although those of the last-named district have been acquired by the firm of C. Weiss & Co., of Lima, for mining purposes.

Molybdenum is found in various parts of the country: in Cascas in Contumazá, Antamina, Huari, Magistral, Pallasca and the provinces of Huaraz and La Convención, but in none of these has it been worked. The most important deposits known which have been examined and worked are those of Rinatullo and Bicran, in Jauja, for the working of which the Sociedad Explotadora de Molibdeno was formed, one of the directors of which is Juan E. Valladares, of Lima. There are two important deposits of tungsten: That of Wolfram de Lircay, in the province of Angaraco, belonging to Diosdato Gandolini, of Lircay, worked in former times; and the Conchico deposit in the province of Pallasca, belonging to Andres Castro, of Trujillo, which is being worked and produces a high-grade hübnerite ore, almost free from iron. The only nickel mines which have been worked are those of Rapi, in the province of La Mar, for the exploiting of which the Compañia Niquelifera Peruana was formed, but which stopped work some time ago, abandoning the mines. These deposits extend into the province of La Convención, in the department of Cuzco, but up to the present they seem not to have been denounced or worked in that department. Deposits of uranium, chromium and titanium ores have not yet been found.

*Peruvian consul general, New York.

Scrubber Water Clarifying*

BY W. PETERSEN†

The cleaning of waste water from blast-furnace gas scrubbers is conducted with difficulty; even large settling ponds yield bad results at times, as in the production of some classes of cast iron such a fine dust is taken up by the water that it will not subside easily. If the space for the clearing pond is limited, this disagreeable feature is doubly felt. By adding a few drops of potash lye to a beaker, which had been filled with such turbid water in the laboratory and kept there for days without any noticeable settling being accomplished, a most surprising change took place. The dust formed balls which would sink to the bottom. Experiments were now made on a larger scale in clarifying tanks with the same gratifying results. Potash lye was, however, too expensive for continued use. So milk of lime was tried to see whether it would answer the purpose. The lime was slacked in a hopper-like tank in such a manner that a small quantity of milk of lime would overflow into the discharge gutter of the waste water and thus get intimately mixed with it. Almost instantaneously upon entering the clarifying pond the dust segregates in great clouds and the water leaving the pond, which is about 80 ft. long, is clear. The consumption of lime per 24 hr. amounts to about 320 kg. (705 lb.), which cleans 40,000 cu.m. of gas and makes 10,000 cu.m. engine gas per hour.

[Note—The application of milk of lime or quicklime in settling fine powder is not new; it was first used on the Witwatersrand about 16 years ago by Charles Butters in settling the slimes from the agitators.—TRANSLATOR.]

*Translated from *Stahl und Eisen*, Feb. 16, 1911.

†Iron Works manager, Charlottenhütte, Westphalia.

The Wabana Iron Mines

By Brenton Symons *

Extensive low-grade hematite deposits are mined at Bell island, Newfoundland; there are six beds but only two can be profitably mined at present.

*Mining engineer, Burwood, Warminster road, South Norwood, England.

The Wabana iron mines, operated by the Dominion Iron and Steel, and Nova Scotia Steel & Coal companies are the largest low-grade iron-ore deposits now being operated in North America. The ore is remarkable for the low sulphur and phosphorus content, and the mines on Bell island are of exceptional interest, because they extend for many thousand feet, below the bottom of the ocean.

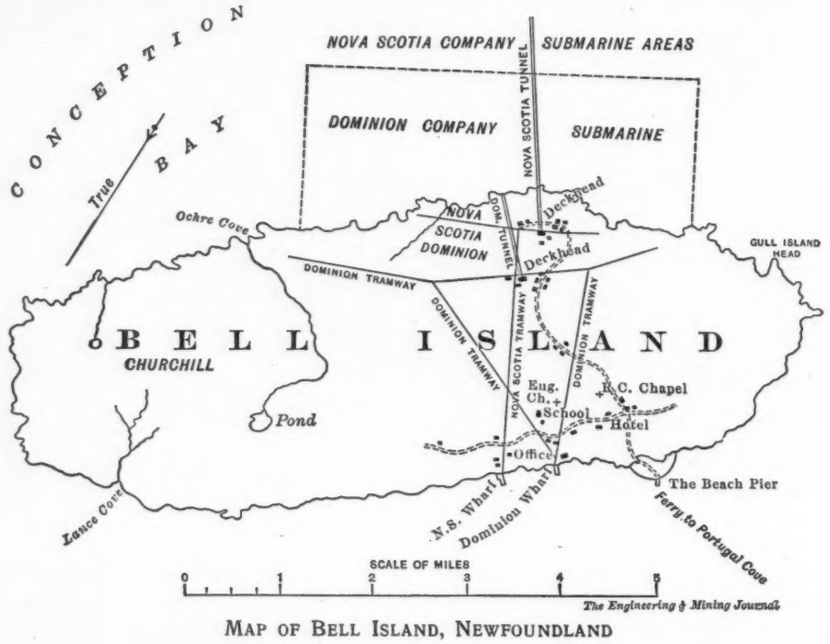
Great Bell island is three miles from the east coast of Newfoundland, opposite Portugal cove, in Conception bay. It is 7 miles long by 2 miles broad, and has an area of 8000 acres. The island is a gently rolling plateau at a general elevation of 250 ft. that drops to sea level in almost perpendicular cliffs. The undulating surface is covered by numerous small woods of spruce and little farms, presenting a striking contrast to the ruggedness of all parts of the main land.

History

Although iron ore covered the surface over many acres of the island, its value remained unrecognized until the summer of 1893. In 1895 operations were commenced on the outcrops; in December, of that year, the first shipment was made, and during the three succeeding years, 600,000 tons were exported. In order to open up the iron-ore deposits in a manner commensurate with their extent, an adequate system of transportation from mine to ship was essential. To acquire the appropriate machinery, a large capital was indispensable, and this the Nova Scotia company obtained by selling, in 1898, a portion of its leases to the Dominion Iron and Steel Company, for $1,000,000. By this arrangement, the resources of two great corporations were combined to extend the operation, so large quantities of hematite ore could be exported.

The relations with Sydney, Nova Scotia, have been of an intimate nature, for, on account of the Sydney coal deposits, the Bell Island ores could be reduced, after a short shipment by sea to the blast furnaces. The distribution of the areas was somewhat involved, as there are two principal seams of ore. In the agreement made between the companies, the lower seam, which was a little lower grade, was allotted to the Dominion company, and the upper seam of a far less area, to the Nova Scotia company; both beds in the 5½ square miles parallel to the shore were allotted to the Dominion, while the 32 square miles of submarine areas outside that limit, lying deep under the waters of Conception bay, were to be the sole property of the Nova Scotia company. At the time of this arrangement, the prolongation of the beds seaward was to some extent problematical.

Both companies immediately developed their properties in building substantial houses, installing ample machinery, constructing tramways, and loading piers for the transit of the ores to the steamers; each company having its own tramways and loading stages. During the first year of exploitation, by reason of the slight northwest inclination of the seam, the ore was so close to the surface, that it was raised and put on board for 39c. per ton, with a freight of 41c. to the Sydney furnaces. As the depth of overburden increased, mining the ore was necessary and the cost increased until now it approaches $1 per ton.



MAP OF BELL ISLAND, NEWFOUNDLAND

Submarine Areas

Although the surface ore is not quite exhausted, slopes, or tunnels have been excavated down both beds and are steadily advancing under the sea. Especially is this the case with the Nova Scotia company which, having practically raised all the ore on the island, has extended its new slope for a mile through the submarine areas of the Dominion company and for half a mile into its own property, and will soon be extending levels through the lower bed of hematite which borings have shown to be of large size and good quality. The production of the island has steadily increased until the yearly output has reached about a million tons.

Geology

The eastern shore of Conception bay is Huronian strata resting unconformably on a Laurentian anticline that occupies a central position in the Avalon peninsula; the opposite shore, 12 miles to the west, is of pre-Cambrian age. Both formations are highly metamorphosed, and are dislocated by many faults that trend northeast. Between these coasts and occupying the greater portion of the bay extends an almost undisturbed series of Cambrian sandstones, slates and shales; the beds sloping toward a center at low inclinations. The conglomerate and slates of this shallow basin fringe the eastern, but have not been recognized on the western shore. Bell island, with its six hematite beds, is included in the topmost stratum of the basin, and the outcrops, inclosed in silicious sandstones which are characterized by numerous fossils of *Lingula*, traverse the island in a northeast direction. Below the ferruginous beds are thin micaceous sandstones, and in the lowest stratum trilobites are found in red and green sandstones, reposing on conglomerate. The conglomerate lies on the edges of the contorted Huronian.

There are outcrops of magnetite on the western margin of Conception bay, supposed to be the equivalent of the hematite seams of Bell island, but this

seems improbable in view of the fact that the rocks which include the magnetites were metamorphosed before the hematite strata were deposited. The Upper Cambrian appears to have been deposited during the tranquil period that followed the metamorphism of the pre-Cambrian, while the undisturbed condition of the strata forming the basin—except for a few unimportant faults—seems to indicate that no folding of the strata has since occurred. The iron ores were probably precipitated by the long continued reaction of organic matter on the soluble iron in the seawater and subsequently consolidated into compact masses by great pressure at low temperature. The accompanying section from Murray's surveys represents approximately the relative position of the hematite beds and the intercalated sandstones.

Two of the Six Beds Are Worked

The stratigraphical sequence of the iron deposits in descending order is as follows: Shales, 56 ft.; hematite, 1 ft.; sandstone, 5 ft.; hematite, 1¼ ft.; sandstone, 2 ft.; hematite, ¼ ft.; sandstone, 3 ft.; hematite, ¼ ft.; sandstone, 2½ ft; hematite, 1 ft.; sandstone and shale, 3 ft.; hematite, 4 ft.; sandstone and shale, 46 ft.; hematite, 9 ft.; sandstone and shale, 288 ft.; hematite, 12½ ft. A total of 434 ft., of which 29 ft. is hematite.

Only the two lower seams are exploited, as at present the upper beds are of no value.

Flat Dip of Beds

The strike of the ore seams is parallel to the principal axis of the island and their dip is 9 deg. to the northwest. The low inclination gives the outcrops a considerable superficial area that has permitted working a great width, opencast.

The lower seam is worked by the Dominion Iron and Steel Company, and has a width of 9 ft. of dense homogeneous hematite of an almost unvarying quality of 50 per cent. iron. As it is 293 ft. below the upper seam and covers 800 acres within land limits, there is a considerable reserve of ore, estimated at more than 20,000,000 tons.

Methods of Taking Out the Ore

The present working faces extend three miles with a cable tramway connecting at two distant points with the shipping station. Following the ore seam there is a tramway slope from the deck head that extends at an angle of 12 deg., some 2000 ft. to the bottom of the mine. A winding engine draws the loaded trucks which are tipped into a pocket whence the ore is charged into 2-ton wagons that travel at the rate of 4 miles per hour to the 25,000-ton pockets at the shipping stage. The arrangements for mining and transportation are similar in character to those of the Nova Scotia Steel and Coal Company. The ore has been proved in the submarine areas and found to be thicker and of rather better quality than on the land. The Dominion company produces over half a million tons per annum, which is shipped to Sydney.

The upper seam, exploited by the Nova Scotia Steel and Coal Company, has a land area of 170 acres and was estimated to have contained 6,000,000 tons of ore, the larger portion of which has been raised and exported. The original slope or tramway follows the ore-bed at an angle of 14 deg., and from it, six levels branch each way, provided throughout their working length with double cable railways.

The stoping is by pillar and stall method. The roof being of solid sandstone allows large excavations; the floor is hard and smooth. At the surface and for some distance down the slope the seam is penetrated by two series of divisional planes, at right angles to each other intersecting the planes of lamination. These are, however, not so separable that the ore can be dislodged by picks, though a charge of dynamite so shatters the rock for several feet around as to allow the more or less rectangular bricks to be easily shoveled into the trucks. In depth these planes persist, but rather less obviously, the blocks falling in larger fragments.

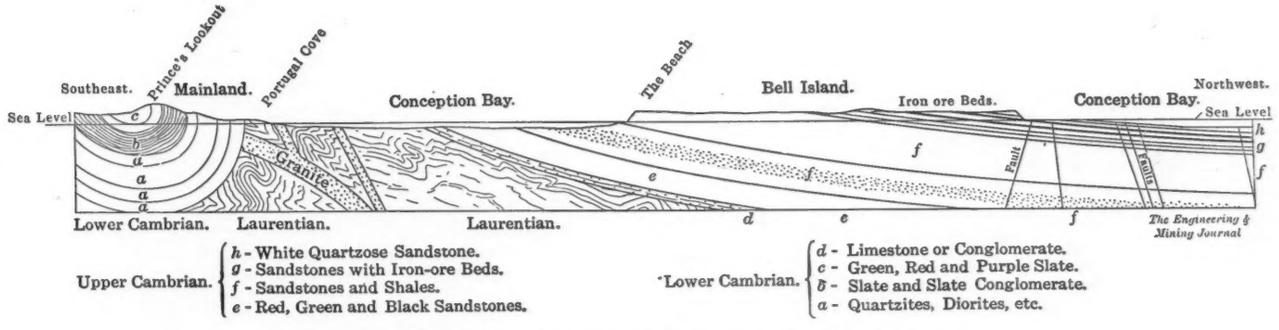
New Slope of Nova Scotia Company

To reach the submarine areas (about a mile from the shore) a new slope was commenced in May, 1906, and at the close of 1908, it had crossed—at a distance of about 4000 ft.—the western boundary of the property of the Dominion company. The piercing of this long tunnel, through which the whole of the mineral mined will be transmitted to surface over a solidly built railway, has been accomplished without any serious difficulties. The influx of water, considering the nearness of the sea bottom, was comparatively small, except at the second fault—1250 ft. from the coast—where a downthrow of 29 ft. was accompanied by 4 ft. of loose ground; this was cut through, the flow of water being 5000 gal. per hour.

On a further advance of 1800 ft. a third fault with a downthrow of 26 ft. was encountered, but this, and other less important dislocations cut through, having a covering of 300 ft. or more, were compact, so that there was little cause for anxiety. The slope has now been extended 6000 ft. under the sea with its termination in the midst of the areas of the Nova Scotia company's property, and levels can be driven right and left through the ore. The extent of the deposit is so great, that the daily output need only be limited by the capacity of the hoisting equipment. There is little doubt that the ore extends over at least 12 square miles and this would give for one seam, 400 million tons.

The dimensions of the excavation were 14x8 ft., all in hematite, and it was driven in three shifts of 8 hours, yielding in 24 hours 140 to 150 tons of 50 per cent. ore. The holes were drilled from 6 to 12 ft. deep by machines, and the dynamite consumed was ¾ lb. per ton, equivalent to the removal of 5 cu.ft. per pound of explosive. The speed of advance averaged 10 ft. per diem.

The ore, on arriving at the summit of the slope, is dumped by a tipple into a Gates crusher for reducing the larger blocks so they can be sorted by boys as the ore passes up a conveyer to the charging pocket, whence it is fed into the tramcars. This sorting raises the hematite from 50 to 52 per cent. The daily output is about 1600 tons, which is transported to the shipping depot.



Geological Section of Wabana Iron Ore Series

Shipping

The facilities for loading the steamers are excellent. The piers of both companies are situated on the landward side of the island, where they are perfectly protected from the waves raised by the fierce "northers," so that there is no swell to affect the steamers when loading. The neighboring piers of the two companies are built against the vertical cliffs of the coast; they are about 100 ft. long and the loading stagings have a hight of 75 ft. above high-water mark, allowing the loading of vessels of 10,000 tons burden through adjustable chutes. There is a depth of 24 ft. of water at the ends of the wharves at low water, but this, in a short distance, increases to 48 ft., while in the bay, which is void of all dangerous rocks and shoals, the water is everywhere profound. Navigation is open for six months in the year; during the winter there is more or less drift ice in the bay and the sea is frozen between the island and the mainland.

Transportation

The system of ore conveyance is excellent, the cost of transmission from the mine pocket to the steamers being 3c. per ton. Underground engines bring the trucks to the shore line, whence the surface winding engine draws them up the slope in trains of 7 cars, aggregating 12 tons of ore, which arrive at the deckhead about every five minutes. Throughout the working levels, that have been made parallel to the plane of the seam of the Nova Scotia company, are endless wire ropes, which grip the cars at the junctions of the temporary stoping tramways. The gage of the lines, size of cars and weight of rails are the same as on the main line to the port of shipment.

The main railway to the loading stage —10,200 ft. long—is straight and is laid on the gently undulating surface of the plateau, the cutting and banking being unimportant. The gage of the line is 2 ft., rails weigh 28 lb. and the steel cars of 20 cu.ft. capacity carry an average load of 1.75 tons. The distance between cars on the cable is 60 ft. and the number employed in the mines and at surface approximates 500. The 3-in. endless wire rope, carried on wooden rollers between the rails, is actuated by a winding engine of 250 h.p., though less than 200 indicated h.p. are required. On arriving at the ore depot the grips, one on each side of the car, are released; it then gravitates to the tipple, thence up a slight incline, whence it automatically runs down on the return line and is regripped by the attendant. One man can tipple 6 cars per minute, although they do not arrive as fast as that. The ore falls from the tipple into a 25,000-ton pocket which has been partly cut out from the cliff. Underneath it the ore is fed to an endless steel conveyer and carried 200 ft. to the summit of the loading stage, whence it runs down the steel chute into the hold of the vessel at the rate of 2000 tons per hour. A 20-h.p. engine keeps the conveyer in motion; the cost of charging is ⅓c. per ton.

New Installations

In view of the extent of the submarine beds of hematite, which will supply ore for a century, the directorate has, for months past, been pressing to completion the erection of more modern and powerful machinery, designed to increase the tonnage and diminish the cost of raising and treating the ore, and its transmission up the two-mile tunnel, a most essential consideration when the saving of only 1c. per ton is equal to $5000 per annum. An electric plant to operate the cables on all the tramways underground as well as at surface; an efficient engine for assuring speedy traction up the new submarine slope, with new machinery for treating the ores, and a new steamer, specially constructed for placing them on the market at the lowest possible freightage, have been purchased.

Wharves

On the old pier on which the present winding engine rests, a new wharf—which exacted the blasting of 8000 cu.yd. of rock from the overhanging cliff—has been finished, measuring about 120x90 ft. This structure has been massively built so that it may carry a large electric power house for working the cable-railway lines, and for a machine grab for transferring coal from the slip to a 20,000-ton coal depot. The grab is also employed to load the coal trucks, which are pushed onto a platform holding two cars that is lifted up the cliff 240 ft. to the terminus of the main tram line, whence they can be transported by the endless cable to any desired point. The power house contains a three-cylinder engine of 750 h.p. for generating electric current; the dynamo is in place and the foundation is laid for another.

The ores of the Dominion company are exported to the furnaces at Sydney, 400 miles distant, the steamers making the return voyage in six days, inclusive of loading and discharging. The freight per ton is uncertain, as the boats are chartered for the summer, but as it is probably under 40c. per ton, it compares favorably with the freightage of most other iron mines. The Nova Scotia company ships its hematite to Atlantic ports of the United States and to Sydney, Great Britain and Holland.

Submarine Slope Equipment

For the working of the hematite beds lying under the waters of Conception bay, the Nova Scotia company is engaged in erecting the finest and most modern machinery, on a scale allowing for an ample increase of the tonnage in the immediate future. A solidly constructed deckhead lies at the termination of the new slope; it is 70 ft. in hight and 300 yd. above the entrance of the tunnel descending to the bottom of the mine. As it is indispensible to run the cars at a high speed, on account of the distance to the face of the submarine stopes, a new winding engine has been erected to haul them up the tunnel incline. The gage of this railway is 3 ft., and to insure safety, 80-lb. rails have been laid on squared sleepers. The cars on arrival at the deckhead are capsized into two Gate's crushers and the ore sorted as it passes over a percussion table that automatically drops it into the charging pocket on the main line to the port. Every device has been employed to spare labor, and the hematite from the moment it leaves the stopes until it is dumped into the steamer is in continual transit, and demands no handling.

Freightage

The conveyance of the ore from the island to market is the most onerous item of expense, consequently, it has received much attention, more especially during the past year, because an important increase in the output is contemplated. To cheapen freight a new steamer—called the "Storstud"—has been built at Walker-on-Tyne on the Isnerwood system of longitudinal framing. The length is 425 ft. and 58 ft. beam, with cylinders of 25½, 47 and 78 in., and capacity of 10,650 tons.

Production and Profit

The exact figures of production were not obtainable on the island, but Professor Hawley, the Government geologist, places the total production of both companies, from the inception of the exploitation in 1895 to the end of 1908, at 6,849,000 tons. The production in 1909 was not less than 900,000 and the export for the current year is expected to exceed a million tons. The precise amount of profit was not obtainable, but is generally admitted to be $1.10 per ton. The value of a ton of the ore at Sydney is about $2 and the cost of mining and freight is probably about 90c. There is now a government duty of 7c. per ton payable on exportation.

Titanium steel rails have now been in use experimentally on the New York Central & Hudson River road for three years. The results have been so successful that the company's rail orders for 1911 include a large proportion of such rails. The titanium steel rails are hard and show a greater resistance to wear than ordinary rails. The specifications for these rails call for the use in the steel of 1 per cent. ferrotitanium, carrying from 10 to 15 per cent. titanium, making 0.1 to 0.15 per cent. titanium in the rail.

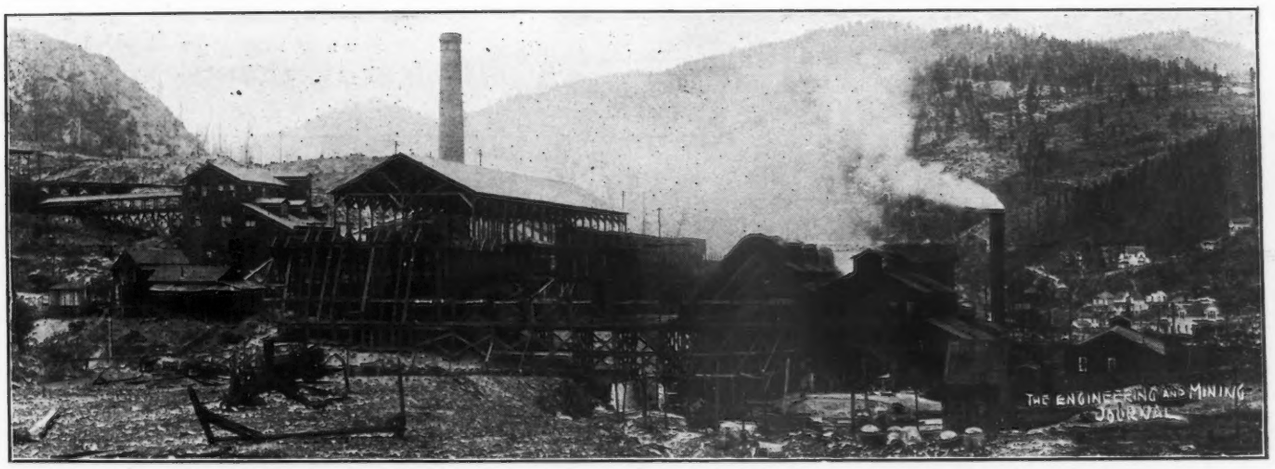
Greenwood Copper Smelting Works

By J. E. McAllister *

The British Columbia Copper Company smelts a charge carrying from 1.1 to 1.3 per cent. copper. It is also low in sulphur. With practically no sulphur elimination, a concentration of about 40 to 1 is obtained. Flue dust produced, 1½ per cent. Slag cars of 250 cu.ft. capacity are used.

*General manager, British Columbia Copper Company, Greenwood, B. C.

The reduction works of the British Columbia Copper Company are situated at Greenwood, B. C., on the Columbia & Western branch of the Canadian Pacific Railway, seven miles north of the international boundary, this being about the center of what is known as the Boundary district of British Columbia. The present plant was designed and built upon the site of a former smeltery, the total time between blowing out on the old furnaces and blowing in the new plant being a few days less than five months. The ore handled is furnished almost entirely by the company's own mines, of which the principal are the Mother Lode group, distant four miles and connected by a branch of the C. & W. railway; the Oro Denoro and Emma group, distant 10 miles; the Jack Pot, Molly Pritchard and Athelstan group in Wellington camp, distant 18 miles; the Lone Star group, nine miles, five of which are covered by an aërial tramway from the mine to the C. & W. railway; and the Napoleon group at Boyds, on the Great Northern Railway, distant 60 miles. The two latter properties are in the State of Washington, U. S. A.



SMELTERY OF THE BRITISH COLUMBIA COPPER COMPANY, GREENWOOD, B. C.

TERRACE LAYOUT FOR WORKS

The railroad enters the works on three different levels, by nine spurs. The upper level delivers all material that requires sampling; the intermediate level delivers coke and all ore that has been sampled before arrival; and the lower level takes away the blister copper product and converter slag and also delivers supplies. At the intermediate level is placed a set of self-registering track scales by which all incoming material is weighed. The accompanying diagram shows the plant in plan and cross-section, illustrating the endeavor to utilize gravity as far as possible in the general scheme of handling; the raw material entering at the higher points and the finished products leaving at the low level. On the high level there are storage bins having a capacity for 2000 tons of ore, three railroad spurs traversing the top of these bins longitudinally.

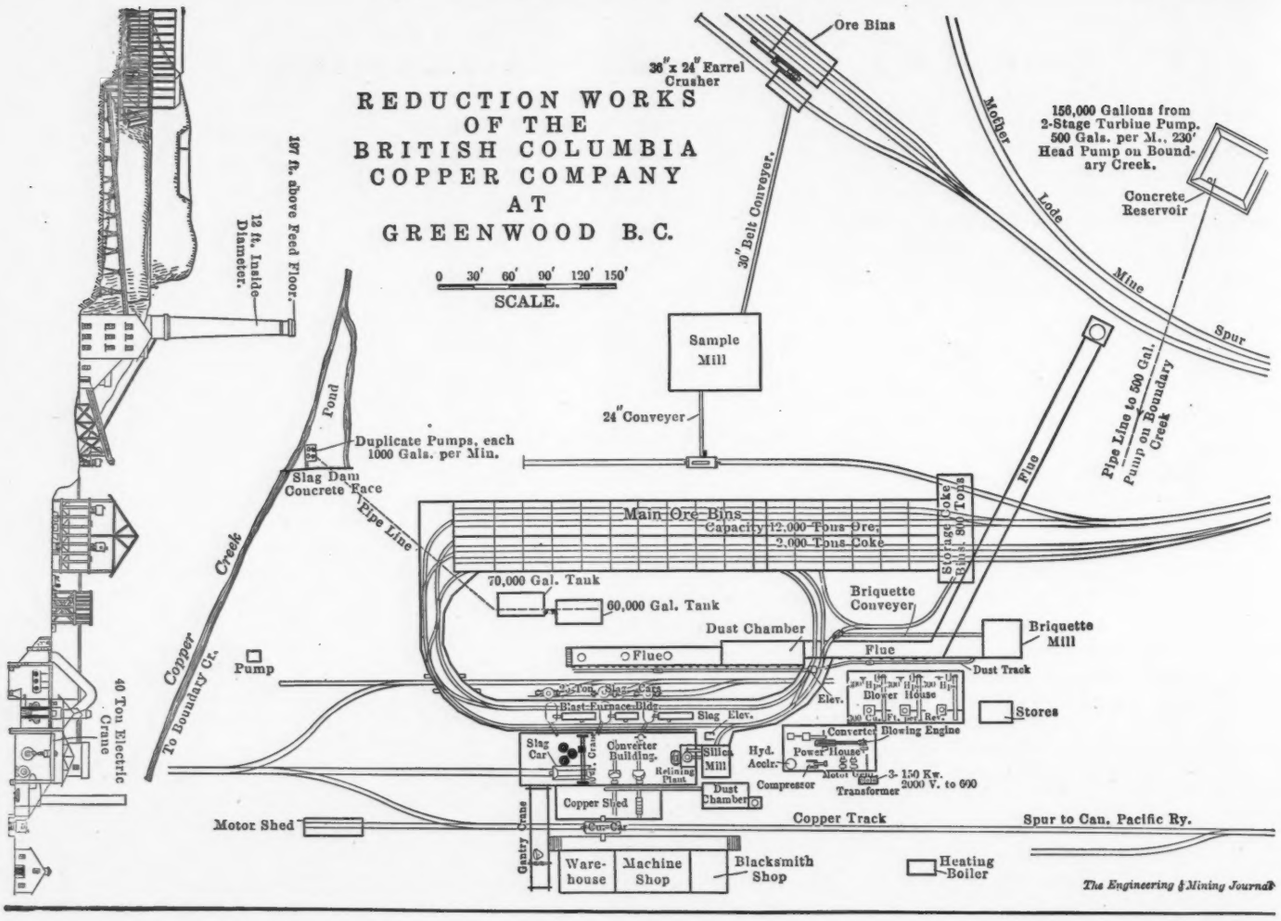
The bins discharge by chutes into a Farrel-Bacon crusher 36x24 in. driven by a 100-h.p. variable-speed motor with jack shaft and belt drive.

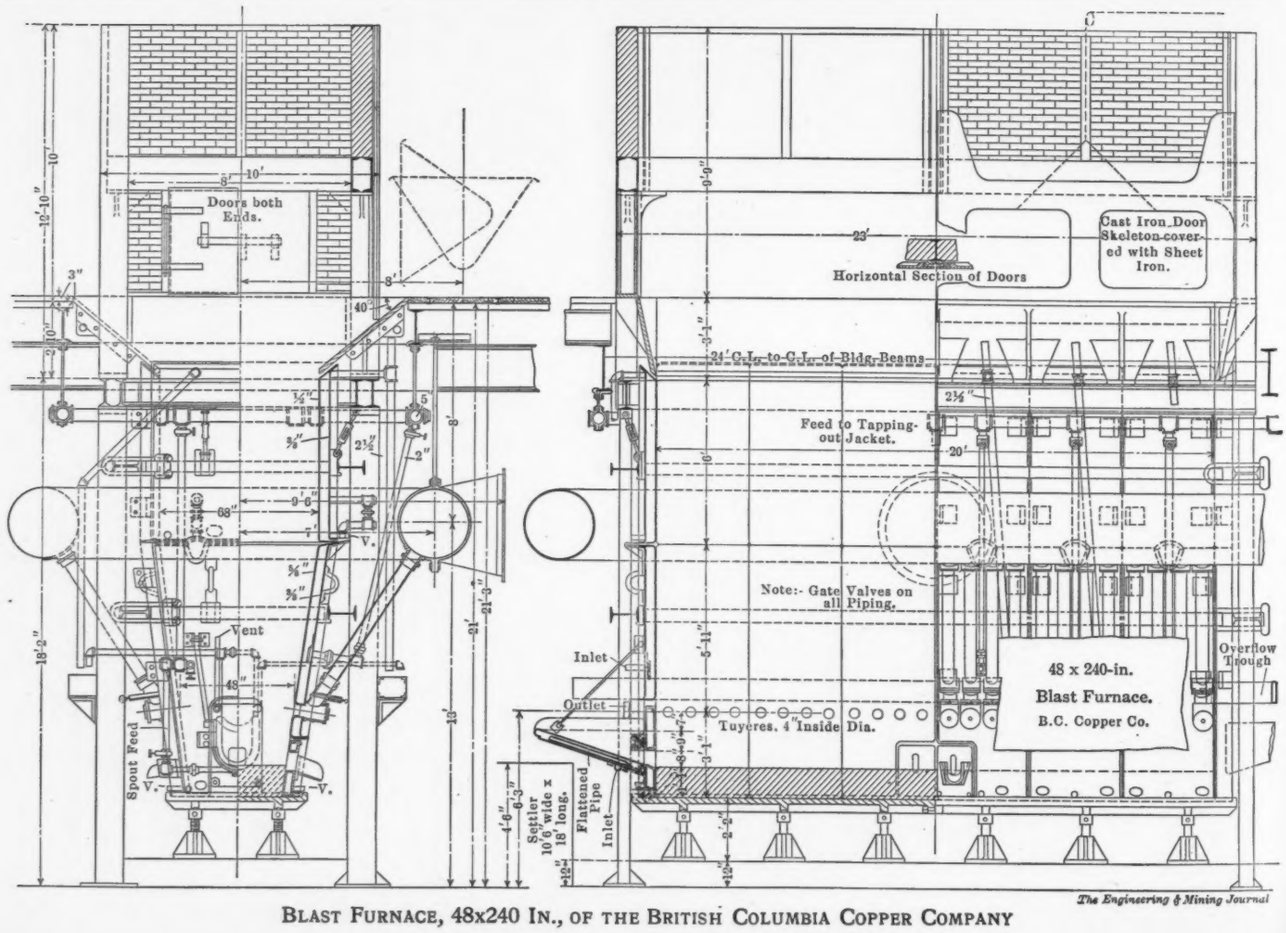
SAMPLING ARRANGEMENTS

The crushed ore passes to the sampling mill by a 30-in. belt conveyer, 225 ft. long, driven from the sampling-mill line shaft. This conveyer delivers into the first sampler which consists of two steel boxes 2 ft. 6 in. by 2 ft. 10 in. deep, attached to double-sprocket chains and moving around three sides of an inverted isosceles triangle. The sprockets are driven from the line shaft by a bevel gear. This device at regular intervals takes the entire stream from the conveyer belt in an amount of approximately one-fifth of the total quantity delivered by the belt, the four-fifths rejected passing immediately to storage bins. The boxes carrying the sample deliver as they reach the end of the horizontal drive into a No. 5 Gates crusher, while the stream of ore falls uninterruptedly during the period that the boxes are out of the way. The arrangement is similar to the sampler described by F. Cazin[1], and to the Van Mater sampler [2]. From this point the process of sampling is fully described in the JOURNAL of April 12, 1902, except that all rejects are now handled by a 26-in. belt conveyer, 116 ft. 3 in. long, instead of being trammed by men as formerly, the conveyer delivering into standard railway dump cars which transfer the sampled ore finally to the smeltery bins. The ore coming from the company's Mother Lode mine is automatically sampled there before shipment.

The sampling mill has been designed with sufficient flexibility to give a sample for hand quartering of approximately uniform size irrespective of the original quantity passed through the mill. This is accomplished by cutting out one of the units of the sampling mill according as the lots are small or large. With all the various automatic steps of sampling in operation the amount left for hand quartering is 1/6250 part of the original quantity, and mill lots of low-grade ores up to 3500 tons in weight are sometimes carried through to one final sample. The entire mill is operated from a line shaft driven by a 100-h.p. 550-volt induction motor, the low voltage being used on account of the dusty atmosphere in which the motor operates. The mill has a capacity of 2000 tons in 16 hours and requires a total of 11 men for operation of the two shifts.

[1] ENG. AND MIN. JOURN., Feb. 12, 1910.
[2] *Ibid.*, Dec. 25, 1909.




Doors both Ends.
Horizontal Section of Doors
Cast Iron Door Skeleton covered with Sheet Iron.
24' C.L. to C.L. of Bldg. Beams
Feed to Tapping-out Jacket.
Note:- Gate Valves on all Piping.
Vent
Inlet
Outlet
Tuyeres, 4" Inside Dia.
48 x 240-in. Blast Furnace. B.C. Copper Co.
Overflow Trough
Spout Feed
Settler 10'6" wide x 18' long.
Flattened Pipe Inlet
The Engineering & Mining Journal

BLAST FURNACE, 48x240 IN., OF THE BRITISH COLUMBIA COPPER COMPANY

Upon the intermediate railroad level which constitutes the top of the smeltery ore and coke bins, there are five spurs diverging from the incoming track which has previously passed across the weighing scales. One of these is for the purpose of transferring material which has passed through the sample mill to the smeltery bins, and the other four are for delivering ore, coke and converter slag, there being two lines of bunkers with two tracks running the length of each.

Storage for 12,000 Tons Ore

The difference in level between the upper and intermediate railroad line is 48 ft., and 31 ft. below this intermediate level is located the electric tram line which transfers the material from the bunkers and the briquetting plant to the blast furnaces. The main section of the smeltery ore bunkers consists of 18 bins in two lines, each bin having a capacity of 600 tons of ore. In addition there are two bins at the extreme south end having a total capacity of 400 tons of coke. The extension section has 12 bins of the same size as the main section and at its extreme north end is a larger storage coke bin of 800 tons capacity. The total capacity of these bunkers amounts to 12,000 tons of ore and 3000 tons of coke. All coke beyond this amount is stored on the ground. Three of the bins of the main section are divided into halves and one into quarters to accommodate small lots of ore and converter slag. Under the bunkers are four parallel electric tramway lines of 36 in. gage, each line being provided with three sets of automatic platform scales, located at regular intervals on the tangent which passes under the ore bunkers.

The four lines converge at each end to a semicircle of a double track ending in two parallel lines which pass on both sides of the blast furnaces. The entire system thus makes up two flat-sided ellipses, one outside of the other and provided with switching arrangements at both ends to allow of the charging trains being changed from any one track to another. The electric-charging railway operates by direct current at 220 volts, this pressure being adopted for the safety of the operatives, and the equipment consists of four 7½-ton locomotives (of which one is a spare unit) and 26 side-dump charging cars, the latter are of the usual V-shaped cross-section, the body being released by a foot-trip underneath when the cars are tipped over for the purpose of discharging their load. In operation there is a charging train to each blast furnace consisting of eight cars for the larger furnaces and six for the smaller, each train carrying an equal number of cars of coke and charge, the train crew consists of three men: a motorman and two loaders.

Method of Charging Furnaces

The train makes up its charge by weighing the first constituents on the nearest platform scale, then adding the next and passing on to the next scale, and so on finally traveling around the semicircular loop to the blast furnace where the charges of coke are dumped first, followed by the ore charges, the size of the latter being from 4000 to 6000 lb. dependent upon the furnace operation. The charging doors of the blast furnaces are raised and lowered by air at 100 lb. pressure. The elevation and cross-section of the smaller blast furnace shows the general design of these. Originally the plant possessed three furnaces 48x240 in. at the tuyeres but the capacity has recently been extended by lengthening the two end furnaces to 48 in. by 360 in., the center furnace remaining as before. By this means a total increase of 33⅓ per cent. of blast-furnace capacity was acquired. From each furnace a steel downtake of 7 ft. diameter in the form of an inverted-V links with the dust flue. The flue of 180 sq.ft. cross-section conducts the gasses into an expansion chamber of 550 sq.ft. cross-section, in which the flue dust is collected, the flue passing on at an oblique angle where it ascends on the natural rise in ground ending in a brick stack 121 ft. high and 12 ft. inside diameter. The hight from top of stack to feed-floor level is 197 ft. Between each pair of furnaces is a large fore-hearth 18 ft. by 10 ft. 6 in. by 4 ft. 6 in. deep; from which the matte is tapped directly to five-ton ladles handled by a traveling crane, and the slag delivered upon the opposite side to the slag railway.

Converter Equipment

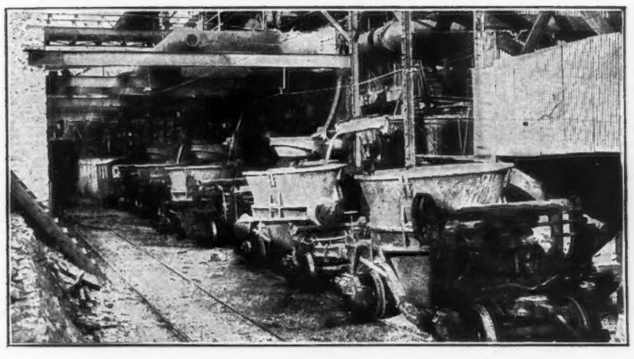
The converter building is 150 ft. long by 44 ft. wide and contains two stands of converters 84x126 in. with seven converter bodies, hydraulic power being used for tilting and a 6-ft. mixing mill for working up the converter linings.

A traveling crane with main hoist of 40 tons capacity and auxiliary of 10 tons serves the plant, four motors giving the required operations of travel and lift. The converter slag is poured into beds on the ground which, when sufficiently cool, are lifted to a grizzly on top of steel railway dump cars, the slag breaking readily into the cars, which are then transferred to the ore bunkers and the converter slag therein delivered for resmelting in the blast furnaces. The blister copper is cast into slabs which are weighed and loaded into railway cars at the lower spur, this track being 61 ft. below the intermediate railway level previously described and passing between the converter building and the repair shops and warehouses, thus facilitating the unloading of incoming supplies and the handling of heavy parts to the shops for repairs. A gantry crane is also provided crossing this lower spur for the purpose of unloading heavy material.

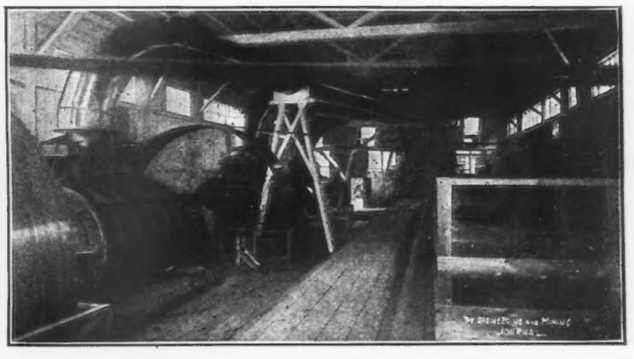
The converter gases are taken off separately from those of the blast furnace in order to keep the high-grade converter flue dust from entering the long blast-furnace flue. The converter flue discharges the gases into an expansion chamber of 281 ft. cross-section in which the dust is collected, the gases passing on into a steel stack of 78-in. diameter and about 75 ft. high. The converter flue dust is fed back into the molten converter charge.

Flue Dust, 1½ Per Cent. of Charge

The blast-furnace flue dust is briquetted in a three-plunger press driven by 40-h.p. motor. About 1½ per cent. of the material delivered to the blast furnace is carried over into the flue. The average



Slag Pots and Tapping Floor



Blower House, British Columbia Copper Company

blast-furnace charge contains enough calcite to constitute a lime bond for the briquets so that nothing need be added for this purpose, the dust only passing automatically through a mixer where the requisite quantity of water is added. The briquets are dried on trays for 24 hours and then fed back to the blast furnaces.

Power is Purchased

Alternating current for all operations is purchased from an independent company upon a watt-meter basis. It is generated 85 miles away and conducted at 40,000 volts to a step-down transformer station near the works where the voltage is reduced to 2200 at which it is received and paid for monthly. The current supplied is 60 cycle and three phase.

The power house is in two adjoining sections. Section *A* contains the switchboard, two motor generators, converter blowing engine, high-pressure air compressor and hydraulic accumulator, and section *B*, the blast-furnace blowers. The switchboard consists of line and feeder panels, upon which are mounted measuring instruments for both alternating and direct currents and the recording watt-meter, which registers the entire consumption. Direct current for operating the traveling crane and the slag and charging railways is generated by two direct-connected motor generators, one of 75 k.w. and the other of 100 k.w. capacity.

Air at 100-lb. pressure is used for tamping converter linings, operating blast-furnace charging doors and pneumatic tools and is generated by a compound duplex compressor of 300 cu.ft. capacity, operating at 150 r.p.m. This compressor is belted to a 50-h.p. induction motor. A triplex plunger pump, 5-in. diameter, 8-in. stroke, 60 r.p.m., capacity 120 gal. per min. at 200-lb. pressure is belted to a 20-h.p. motor and operates the hydraulic accumulator, the ram being 24-in. diameter and 10-ft. stroke. The converter blowing engine consists of one side of a cross-compound machine having an air cylinder 40 in. diameter by 42 in. stroke and capacity 5000 cu.ft. per min., with rope drive, power being furnished from a 300-h.p. variable-speed induction motor. This machine has foundations, driving wheel and crank shaft arranged for the addition of the other side whenever necessity requires. Each blast furnace is independently connected with a rotary blower of 300 cu.ft. capacity per revolution and these are operated at 85 r.p.m. At the point where the blast pipes leave the power house they enter a header with a valve system which permits the interchange of blowers to the different blast furnaces. The blowers are designed to deliver their rated capacity at any pressure up to 40 oz. and are each belt driven by a 300-h.p. squirrel-cage induction motor, the belts being 40 in. wide.

Slag-handling Devices

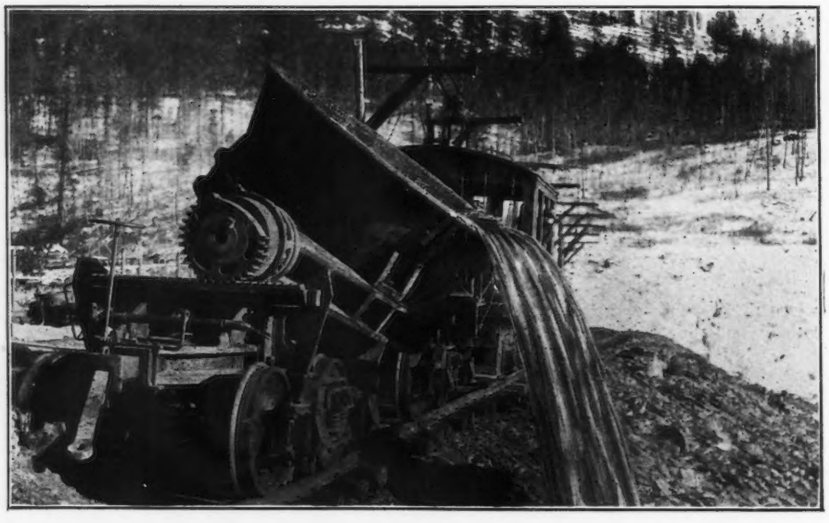
The blast-furnace slag is handled in trucks of the type of cinder car used in the production of iron and steel, each truck having a capacity of 250 cu.ft. of molten slag. Power for traction is furnished by 35-ton electric locomotives and each truck is provided with a 15-h.p. motor, mounted on its frame, which furnishes the power for tilting the car in order to discharge the molten slag. The tilting motors are operated from a controller located in the locomotive cab and the current is transmitted to these tilting motors from the trolley wire by means of extension cables which are coupled up between the locomotive and the trucks at the same time as the traction coupling is made. During the interval of changing these slag cars a smaller ladle supported upon a swinging arm intercepts and receives the slag stream, dumping its contents into the empty bowl after the change is completed. The slag trucks are designed with an especially steep-angle dump of 47. deg., to enable the bowls to clear themselves of the shell of slag when tilted to the extreme limit of the worm gear.

It is hardly possible to place a figure which represents the exact cost of the works, as the present plant was built upon the site of an old plant, a portion of the masonry of which was utilized, but the entire cost, including the former plant and the present one amounts to approximately $900,000.

The plant is equipped with a complete water system and this item has received much attention, there being two sources of supply, one by gravity from Copper creek above, and the other by means of two 500 gal. per min. turbine pumps from Boundary creek below the plant. These pumps are two-stage and direct connected to induction motors, their control being independent of the power-house switchboard in order to insure protection from fire. In addition a concrete reservoir of 150,000 gal. capacity is provided, which may be connected into the water system from a point above any of the plant buildings.

The water from the blast-furnace water jackets is returned to a cooling pond from which it is pumped back to the service tanks through a 14-in. main by two direct-connected centrifugal pumps, each of 1000 gal. per min. capacity, operated by induction motors. The piping of the water system is arranged in independent circuits as an added protection against fire and also to permit of the shutting off of any section for repairs. The blast furnaces require about 40,000 gal. per min., there being nine water jackets with 36 tuyeres on each side of the two larger furnaces and six jackets with 24 tuyeres on each side of the smaller center furnace.

The ore from the different mines is mixed in the charge cars to form a rapidly smelting mixture, the furnace capacity being about 7½ tons per 24 hours per sq.ft. of hearth area, or 2400 tons per day from the three furnaces. The average copper contents of the furnace charge would be from 1.1 to 1.3 per cent. in the form of chalcopyrite, carrying $1.10 to $1.20 in gold and silver. This, it will be seen, gives a low matte fall, necessitating careful work in order to maintain rapid smelting and prevent the building of large incrustations of chilled material in the furnace. Endeavor is made to maintain a slag of an analysis in its chief components of: SiO_2, 42 per cent.; FeO, 24; CaO, 22; Al_2O_3, 9 per cent., and a matte of 45 to 50 per cent. copper tenor. Iron occurs in the ores as pyrite (with some pyrrhotite) and magnetite, and the lime as calcite, but a deficiency in sulphur has to be supplied from the company's Napoleon mine, the



Slag Car, British Columbia Copper Company

ore from which is a pyrrhotite. From 12 to 14 per cent. of coke carrying 22 per cent. ash is required to smelt the charge.

Low Sulphur Elimination Desired

Blast pressure is from 16 to 24 oz. This however, as well as the percentage of fuel is manipulated to keep oxidation to the lowest limits and eliminate as little sulphur as possible in the process of smelting. The hight from center of tuyeres to feed floor is 15 ft., about 13 of which is utilized and the ore is of such nature that it decrepitates readily upon heating, thus permitting coarser crushing (to about 8 in.) than would otherwise be the case.

To distribute properly the fuel and ore charges each furnace is provided with two lines of hanging baffle plates which swing from 4-in. heavy hydraulic piping, supported upon the feed-floor level by the end castings of the furnaces. The material in leaving the charge cars strikes the apron plates and is delivered against these suspended baffle plates which thereupon swing inward, their weight making a satisfactory distribution of the charge in the furnace. The charge cars are of 55 cu.ft. capacity, and into the larger furnaces four fuel cars are first discharged and on top of this four more deliver their ore charges. The length of the furnaces permits charging from eight to 12 tons of ore at a time on each side. On the smaller furnaces six charge cars are used to a train instead of four: three loaded with coke and three with ore.

The blast furnaces are provided with a trapped spout at both ends and the forehearths are between the furnaces which arrangement admits of the repairs to the fore-hearth without stopping the furnace operations as each furnace is served by two fore-hearths. The small matte fall has a tendency to cause freezing of the forehearth tap holes which is overcome by burning out with an electric arc. For this purpose a 1-in. diameter carbon about 30 in. long is used.

The converter floor is about four feet below the blast-furnace tapping-floor level, and the converter plant has a capacity of 40 to 50 tons of 45 per cent. matte per 24 hours. The shells are lined with silicious gold ores purchased for this purpose from which a smelting toll is realized. Pneumatic tamping is used in relining the shells and the blast pressure for bessemerizing the matte will vary from seven to 12 lb. To operate the plant the following force is required during the 24 hours: Superintendents and warehouse clerks, 4; shift bosses, 5; sampling mill, 11; blast furnaces and briquet mill, 61; converting department, 15; powerhouse, 3; mechanical and electrical force, 12; slag dump and general labor, 9; total, 120; or approximately 20 tons of ore per day to each employee, including superintendents and foremen.

Mineral Production of Germany

A preliminary statement from the Imperial Statistical Office, as published in *Glückauf*, gives particulars of the more important items of the mineral production of the German Empire for the year 1910. The figures are given below, in comparison with those for the preceding year.

Ores and Metals

Table I gives the production of metallic ores for two years past, in metric tons.

I. PRODUCTION OF ORES

	1909	1910	Changes
Gold & silver ores.	7,510	6,646	D. 864
Copper ore	798,618	925,957	I. 127,339
Lead ore	159 853	148,497	D. 11,356
Zinc ore	723,566	718,316	D. 5,250
Iron ore	25,504,464	28,709,654	I. 3,205,190
Manganese ore	77,177	80,559	I. 3,382
Arsenic ore	6,150	6,151	I. 1
Pyrites	198,689	215,708	I. 17,019
Miscellaneous	10,896	10,801	D. 95

Of the copper ore in 1910 the Halle district produced 840,675 tons. Of the zinc ores 591,154 tons were mined in Silesia. The chief producers of iron ore were: Elsass-Lothringen, 16,652,144; Luxemburg, 6,263,391; Bonn, 3,236,788 tons.

The output of metals and of by-products from metallurgical works is given in Table II, in metric tons, except gold and silver, which are given in kilograms:

II. METALLURGICAL PRODUCTION

Metals:	1909	1910	Changes
Gold, kg.	5,064	4,625	D. 439
Silver, kg.	400,562	420,003	I. 19,441
Copper, tons	33,377	37,223	I. 3,846
Tin	8,995	11,295	I. 2,300
Lead	167,918	157,851	D. 10,067
Zinc	219,766	221,395	I. 1,629
Pig iron	12,512,257	14,227,455	I. 1,715,198
Arsenic	2,911	3,066	I. 155
Sulphur	1,186	1,272	I. 86
Misc. metals	7,835	9,245	I. 1,410
By-products:			
Copper sulphate	6,211	5,210	D. 1,001
Sulphate of iron	21,839	18,677	D. 3,162
Tin chloride	3,247	3,291	I. 44
Sulphuric acid	1,413,812	1,572,792	I. 158,980
Misc. acids	10,543	8,294	D. 2,251

Lead production in 1910 included 3581 tons litharge. Copper production included 34,921 tons refined copper, 2302 tons black and blister copper. Particulars of the pig-iron production have been given heretofore. The production includes that from imported ores, as well as from ores mined in Germany.

Nonmetallic Products

The production of coal and other nonmetallic minerals is given in Table III, in metric tons:

III. NONMETALLIC PRODUCTS

	1909	1910	Changes
Coal	148,788,050	152,827,777	I. 4,039,727
Brown coal	68,657,606	69,473,883	I. 816,277
Total coal	217,445,656	222,301,660	I. 4,856,004
Graphite	6,774	7,415	I. 641
Asphalt	77,537	81,186	I. 3,649
Petroleum	143,244	145,168	I. 1,924
Rock-salt	1,369,805	1,424,064	I. 54,259
Kainit	3,181,349	4,249,668	I. 1,068,319
Other potash salts	3,860,685	4,062,004	I. 201,319
Miscellaneous	687	381	D. 306

The total crude potash salts mined were 7,042,034 tons in 1909, and 8,311,672 in 1910; an increase of 1,269,638 tons.

The commercial salts as prepared for market in the various chemical works, in metric tons, are given in Table IV:

IV. PRODUCTION OF SALTS

	1909	1910	Changes
Domestic salt	648,751	669,959	I. 21,208
Potassium chloride	624,994	741,560	I. 116,566
Magnesium chloride	31,526	32,207	I. 681
Glauber salts	71,814	84,787	I. 12,973
Potassium sulphate	68,539	84,583	I. 16,044
Pot.-mag. sulphate	38,723	37,439	D. 1,284
Magnesium sulphate	53,812	57,359	I. 3,547
Aluminum sulphate	22,655	19,448	D. 3,207
Alum	2,973	3,200	I. 227

There was a slight decrease in the average values of nearly all these salts in 1910, as compared with the previous year. There were considerable increases in production of all except a few of the less important salts.

Round Mountain Report

In the fifth annual report of the Round Mountain Mining Company, which owns 344 acres of mineral land and a mill at Round Mountain, Nev., it is stated that during the last year two dividends amounting to $60,658 were paid.

At the end of the fiscal year the ore reserves developed on three or four sides were 111,928 tons, estimated to be worth $9 per ton. During the year 36,252 tons were milled from which a recovery of $8.34 or 89.64 per cent. was made at a cost $5.61 per ton. One foot of development work, at a cost of $8.11 per foot was done for every 5.56 tons of ore milled, and ore reserves were increased to the extent of 10.14 tons per foot of development.

The costs of mining and milling were greater than had been anticipated, due to the extraordinary expense of litigation and temporary injunctions against removal of certain bodies of developed high-grade ore, necessitating a limitation of mining work to such parts of orebodies that were not involved in controversy. Of the developed ore only 3060 tons is in disputed territory.

PRODUCTION, COSTS AND PROFITS

		Per Ton.
Mining: Stoping	$2.39	
Development	1.47	
		$3.86
Milling		1.28
Bullion, tax, etc		0.13
General expense		0.34
Cost, including depreciation		$5.61
Litigation		0.56
Total expense		$6.17
Miscellaneous earnings		0.15
Net cost		$6.02
Net profit		2.32
Bullion sales (11 months)		$8.34

During the present year the capacity of the mill will be increased 50 per cent.; approximately $14,000 will be spent for new equipment.

Barium salts are much used in Italy, one peculiar use being in connection with the manufacture of Gorgonzola cheese; the cheeses receive a thick coating of heavy spar, which permits just the proper amount of aëration.

The Pilares Mine at Nacozari

Special Correspondence

The principal copper mineral is chalcopyrite which occurs in coarse seams through a much brecciated porphyry, enabling the 2000-ton concentrator to make a recovery of 84 to 86 per cent. of the copper in the ore.

The Pilares mine of the Moctezuma Copper Company is six miles southeast of Nacozari, Sonora, Mex., and about 85 miles south of Douglas, Ariz. The mine takes its name from the great green pillar-like rocks at the top of the mountain. Ore was found at a depth of 60 ft., and the oxidized zone was found to be barely 20 ft. in thickness.

The Pilares mine lies in a rugged, hilly country, and is reached from Nacozari by a narrow-gage railroad, over which the ore from the mine is hauled to the new concentrator at Nacozari. The ground has been proved by diamond-drill boring. The ore occurs in a broad friction zone of broken porphyry. The ore is auriferous chalcopyrite, though bornite occurs with pyrite. There seems to be no clearly defined foot-wall, and until recently the orebody was believed to be about 800 ft. wide and 1500 ft. long at the top, increasing with depth. The ore mined assays about 3.22 per cent. copper. In plan the orebody is semi-circular. Early work was confined to the southeast side, as it was for a long time supposed that the orebody was limited on the south by a dike of *caliche*, but development work has proven that the ore extends far to the east beyond that supposed boundary line, on all levels from the second to the ninth. The Y-shaft, sunk from the Porvenir tunnel level (from the seventh to the tenth) shows both the eighth and ninth levels rich in ore that has been cut on both sides of the *caliche* in drifting toward the Santa Cruz stopes.

The Pilares mine is practically without water; the long tunnels driven under the workings and the shafts perfectly ventilate the mine. From one of the stopes the company extracted 150,000 tons of ore. The uniformity and shape of the orebody in the Pilares mine permit systematic development.

Method of Stoping

The ore was extracted in stopes 100 ft. square. After removing the ore, the depleted stopes were formerly caved in from the surface, left empty, or filled, according to the hardness of the rock. For filling, rock was quarried from a hill immediately adjacent to one of the main vertical shafts. When one stope had been drawn and filled, another 100-ft. square was stoped, and the process repeated the entire length of the orebody. Another section was then started, with 100 ft. between it and the first, and the same plan followed. The section between could then be stoped while the ground was held by the broken rock on either side. Now the ore is mined in approximately this size section, but the stope is filled with waste and the men work on top of it as they break down the next slice across the roof. The 25-ton cars, drawn by electric locomotives, run into the mine through an adit a mile long. The ore chutes are cut through rock and the ore is drawn directly into railroad cars.

The Mills

There are two mills, but the old one is no longer in use. The old concentrator designed by L. D. Ricketts had a capacity of 600 tons daily and was operated by electric power; it was equipped with two Blake crushers, four sets of 54x30-in. roughing rolls, two sets of finishing rolls, 24 revolving screens, 10 five-foot Huntington mills, 48 Hartz jigs, 56 six-foot Frue vanners, 20 Bartlett tables, seven settling tanks and hydraulic classifiers.

In this old mill the experiments were made to determine the equipment for the new plant designed by H. K. Burch and completed in June, 1908. The new mill has a capacity of 2000 tons daily. The equipment includes 15 Allis-Chalmers three-phase, 60-cycle, 220-volt induction motors, of 10 to 75 h.p. each, and 70 Risdon-Johnson concentrating tables. This mill makes concentrate of about 12 per cent. copper, saving about 86 per cent. of the metal in the ore.

The mill is built of steel and concrete throughout. The gallery floors are made of reinforced concrete as are also the elevator housings and settling tanks. The launders are placed in tunnels beneath the floor of the concentrating tables, as was done at the Boston Consolidated mill, at Garfield, Utah. Dust collectors are used wherever dry crushing is done with such good effect that the atmosphere of the mill is practically free from dust.

All ore is weighed by Blake-Denison machines, and before going through the rolls passes on a conveyer belt below large electromagnets to remove such pieces of iron as may have become mixed with the ore. The old smeltery is not used now. All the concentrate is shipped over the Nacozari railroad to the Copper Queen smeltery.

During 1910 the mill treated 447,555 tons of ore of an average tenor of 2.99 per cent. copper, from which 107,014 tons of concentrate containing 11,301 tons or 10.56 per cent. copper was produced. The yield of copper was 2.5 per cent. of the ore, the ratio of concentration 4.182:1, and the tailing assayed 0.60 per cent. copper.

The production of ore for 1910 was 434,773 tons delivered to the railroad bins, of which 74.3 per cent. came from cut-and-fill stopes; 8.7 per cent. from development work; 13.9 per cent. from swell of shrinkage stopes and the remainder from the reserves of previous years. An addition of 120,982 tons was made to the reserves, making the total ore broken during the year 555,755 tons.

Most of the underground workers, and many of those on the surface, including machinists and the workmen in the concentrators, are Mexicans. The company has erected a fine casino, including a little theater, where moving pictures and dramas are presented for the benefit of the employees. There is also an excellent company library, well stocked with works in Spanish and English, pool and reading rooms, and bowling alley.

Power Plant

The power plant was completed in 1908; it has a battery of Sterling boilers with reinforced-concrete stacks 196 ft. high. Steam turbines and electric generators supply power for the camp, the concentrator and the mine. The total power for the year 1909 was 8,584,090 kilowatt-hours, the average having increased 50 per cent. over the previous year, but the coal consumption was 3.05 lb. per kilowatt-hour less. A Roney stoker installed at one of the boilers showed an increased evaporation of 1.2 lb. of water over hand firing. The other boilers are to be equipped with these stokers, and machinery installed to convey coal from the storage bin. Both gas and steam power are used at the old power plant, principally the former. Loomis-Pettibone generators make both producer and water gas, which are stored in separate gasometers of 15,000 and 5000 cu.ft. capacity, respectively. The gases are mixed before using. The old power plant has eight 100-h.p. Crossly, single-cylinder, four-cycle gas engines, and one of 200 h.p. These engines are connected with 65-kw. and 150-kw. generators. The current is sent to more than 40 motors at 250 volts. The electric power to the mine is transmitted six miles at 6600 volts, and stepped down at the mine to 230 volts for the pump. The hoists and electric locomotives use the 250-volt current direct.

Use of Quartz in Tube Mills

By A. G. Quartano *

Quartz is an effective grinder but not a good lining. In feeding a mixture of quartz and pebbles, the pebbles make up the lining, the quartz stays in the charge, and the advantages of both materials are gained.

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One of the most popular modifications introduced into tube-mill practice, has been the substitution, wholly or in part, of hard quartz for imported pebbles; the necessary quartz being usually obtained from the workings of the mine producing the ores treated. At first glance, the economy effected by such a substitution appears obvious, and of such considerable magnitude as to put the point beyond dispute. Ore used for this purpose can generally be obtained in sufficient quantity from those stopes where material of this kind is found and mined along with ore of milling grade. The use of this hard, low-grade quartz for loading tube mills provides a convenient outlet for this material, which would otherwise have to remain in the stopes as filling.

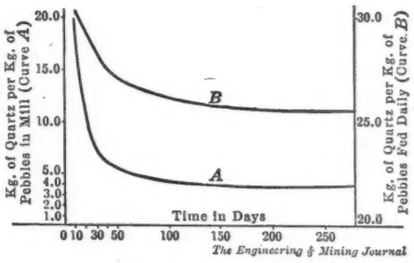
The introduction of this way of economizing in the direction of tube-mill pebbles has gone hand-in-hand with the adoption of the ribbed liner, as running a smooth-lined tube mill with raw mine rock is a harassing experience that no mill man would willingly repeat. It is possible that a satisfactory difference in fineness between the feed and discharge of the mill might be produced under these conditions, by speeding up the mill considerably, so as to compel the fragments of rock to cling more to the periphery of the mill; but, at normal speeds, the rock appears to settle in a mass in the mill, the largest and flattest fragments clinging closest to the lining and producing an amount of slip that effectually prevents any considerable portion of the mass being lifted high enough to fall with sufficient force to trim its component fragments into more or less round shape.

Quartz Does Not Protect Lining

A tube mill freshly relined with ribbed liners and charged with angular pieces of mine rock, does not take long to trim the corners off each piece of quartz and reduce it to some semblance to an imported pebble; although the crushing may be so bad during this trimming process that the tails of the mill will, at first, actually be coarser than the feed. If such a mill be opened and examined two or three weeks after starting, when it settled down to its work and is grinding well, it will be found that, with the exception of an occasional small gap, the corrugations in the lining are neatly filled with smooth pieces of quartz of various shapes, such as also fill the body of the mill. One might be led to suppose from this that, in addition to producing almost as good results as the bought pebbles in crushing the ore, the mine quartz performed as successfully the function of protecting the steel lining from wear. The dangerous nature of this fallacy, however, is soon rubbed in by a rapid rise in the cost of liners per ton of ore slimed. A ribbed lining which would last 11 months in a mill charged with pebbles, will have to be renewed after about six months' run on mine quartz.

Lost Time with Quartz Lining

The increased cost of the lining is of small importance compared with the economy effected by the substitution of inexpensive mine rock, carrying small



Quartz in the Tube Mill

values, for the costly imported pebbles. The time lost in frequent examinations of the interior, occasional renewal of the whole lining and frequent replacement of single plates here and there, however, is a nuisance that assumes less or more serious proportions according as the plant is treating rich ore, in quantity well within its capacity, or is being driven hard to keep up production by the treatment of a large tonnage of medium- or low-grade ore. In the latter case, the increased steadiness in running produced by an expenditure which becomes inconsiderable when spread over a large tonnage, might well tempt one to the exclusive use of bought pebbles. Apparently, a material of considerably greater hardness and somewhat more spherical shape than the mine quartz is needed for the purpose of keeping the corrugations well filled, and so protecting the steel of the lining from the wearing action of the sand. It is for the proper performance of this work that the presence of pebbles in the tube mill is indispensable. A good pebble of suitable size, having become jammed in the widest portion of the corrugation, will wear slowly at the points of contact with the liner, and this wear will be taken up by the pebble being driven further into the corrugation, a little flatter in shape but still admirably suited for the reduction of wear in the ribs of the lining.

A Mixture of Quartz and Pebbles Indicated

Mine quartz, on the other hand, becomes released easily and, during the time that elapses between the loss of one piece of rock and the entrance of another, a considerable portion of the lining may be worn away. Such being the case, one would expect the lining to exert a selective action on a mixture of the two materials, returning the softer mine rock to the body of the mill, and gradually replacing it with pebbles. That such a condition does obtain, anyone may prove for himself by carefully examining the lining of a mill that has run three or four months on "mixture." It will be found that, almost without exception, the corrugations are filled with good pebbles. Meanwhile, the proportion of pebbles in the body of the mill will have risen considerably, owing to the greater resistance of the pebbles to wear. The object of these notes is to show how advantage may be taken of these facts to determine the proportion of the two materials which should be used so as to enjoy simultaneously the advantages of both systems in such a way as to produce the maximum of economy. The point is well illustrated by figures obtained from mills under my supervision.

The records of the distribution of costs showed that, while, as already said, the use of mine rock alone produced high costs due to frequent repairs, the pebbles necessary for running on pebbles alone cost too much to make such a course advisable. In the hope of escaping these two evils, it was decided to steer a middle course by putting 50 kg. of pebbles into each mill at the commencement of the day and then adding mine rock until the mill had its proper running load. In face of the large quantity of mine quartz necessary per mill per day when no pebbles are used—about 1600 kg. in this case—the economy produced by this trifling use of pebbles is astonishing, but is easily explained by the help of a little simple arithmetic. It was found that one of the mills in question, if started with a full load—about nine tons—of pebbles, needed to be fed with 250 kg. of them per day to make up for the loss of load brought about by attrition. That is,

whereas a large proportion of the charge —represented by the ratio 1600:9000— had to be renewed at the end of each day's run with mine rock, the use of pebbles reduced this proportion to only 250:9000, or 1:36.

If we now suppose a mill charged with mine material to be fed daily with 50 kg. of pebbles, followed by the necessary quantity of mine rock, it is immediately evident that the proportion of mine rock to pebble inside the mill will fall gradually as also will the amount of quartz to be added every day. The weight of pebbles contained in the load of the mill, on the other hand, is given by summing a geometrical progression, of which the first term is 50 kg., the common ratio 1:36, and the number of terms the days that the mill has been running. The sum of such a series will continually approach, although never actually reaching, the figure 1800. This is shown graphically in curve *A*, in which the proportion of rock to pebbles in the mill is shown gradually to approach four to one.

Use 20 Per Cent. of Pebbles to Protect Lining

Twenty per cent. of pebbles in the total load of the mill should be sufficient to insure the proper protection of the lining. Curve *B* shows that the amount of mine rock added per day likewise decreases gradually until it becomes 1280 kg., when it remains constant. The point suggested by these figures is that one may make a mill so circumstanced do its best crushing from the first day it runs by filling it with rock and pebbles in the proportion of 4:1 before beginning a campaign. In fact, the author's practice with mills using these materials follows these lines quite closely. Two tons of pebbles are put into the mill, the door closed, the mill started, and then mine rock added until the mill is full. Every day after this, 50 kg. of pebbles are added and as much mine rock as may be necessary to keep up the level of the load in the mill. The object of first adding two tons of pebbles is to encourage the selective action of the ribbed liners on the two materials, so as to fill the corrugations with good pebbles as soon as possible.

Further Study Needed on Tube Mills

In view of the rapid fall in crushing efficiency brought about by a small lowering of the bed of rock in a tube mill, it is open to question whether the maintenance of a higher proportion of pebble might not be profitable, although a good deal can be done by having the mine rock added at regular intervals during both day and night. In the present case, for instance, increasing the daily increment of pebble to 100 kg. would have the effect of raising the proportion of pebbles in the load to 40 per cent.; and a daily addition of only 960 kg. of quartz would then be sufficient. The most economical proportion of the two materials depends on several factors, and the millman who takes the trouble to determine it in his particular case, on these lines, will find himself well repaid by a drop in crushing costs on tube-mill account.

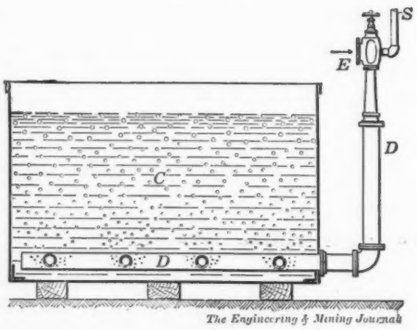
Pneumatic Agitation

By Oskar Nagel*

Air compressors are generally used in the cyanide process for supplying the aëration necessary accordng to the equation:

$$2Au + 4KCN + O + H_2O = 2KAu(CN)_2 + 2KOH$$

If, without any extra expense the air for this reaction could be furnished by means of an appliance in which direct steam is the acting medium, it would mean a great advantage as compared to the present process, since the aëration would be coupled with a simultaneous costless heating of the solution. The effect of heating is important in the cyanide process, as it means an acceleration



Air-jet Agitator

of the reaction and more rapid solution (Nernst has shown that in nearly all reactions the speed is doubled by a 10-deg. C. increase in temperature).

An apparatus suited for sucking or pressing air by means of steam through liquids is the steam-jet exhauster, shown in the accompanying illustration. *D* is the discharge, *E* the gas and *S* the steam entrance.

Compared with air pumps, these instruments have advantages which give them the preference wherever they are applicable, viz: (1) They have no moving parts and need practically no repairs; (2) the cost of the jet apparatus is only a fifth that of air pumps; (3) the jet apparatus may be simply inserted in the pipe line, while air pumps, as a rule, require foundations, and often separate buildings. These steam-jet exhausters are constructed for a mean steam pressure of 45 lb., and are built with capacities from 100 to 60,000 cu.ft. per hour.

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La Rose Consolidated

As the La Rose Consolidated Mines Company and its subsidiary companies, operating at Cobalt, Ont., have changed their fiscal year to correspond with the calendar year, a report is presented for the seven months ended Dec. 31, 1910. In these seven months the shipments and profits were nearly as great as for the previous year. The total production was 2,569,905 oz. silver at a cost of 19.11c. per oz., and the average selling price was 53.955c. per oz. a profit of $909,408 or 65 per cent. of the gross value of the ore, as against 56 per cent. in the fiscal year previous. Owing to treating the low-grade ore locally, the value of ore shipped rose from $228 per ton to $437. Six per cent. dividends were declared in the seven months under review.

The details of the shipments are: Silver-cobalt-nickel ore, 901.879 tons carrying 1601.36 oz. per ton silver, 9.60 per cent. cobalt, and 5.18 per cent. nickel. low-grade silicious ore, 913.701 tons carrying 160.41 oz. per ton silver; concentrates, 559.391 tons at 716.83 oz. per ton; nuggets and bullion, 5.620 tons at 22,555.-36 oz. per ton. During the seven months $4208 were received for the cobalt in the ore, but the market for cobalt is now so poor that nothing is being paid for it. The total cost was $199.47 per ton of ore, of which $117.70 was for mining, and $52.44 per ton marketing expense. Of the $117.70 per ton for mining, $36.30 was for exploration and development. Ore reserves on Dec. 31, 1910 are estimated at 2929.1 tons high-grade ore carrying a total of 3,566,412 oz. silver, and 83,829 tons low-grade ore carrying a total of 1,989,836 oz. silver, a total of 5,556,248 oz., at an estimated net value of $2.-034,687.

Quicksilver in Russia

In Russia quicksilver is produced in the government of Ekaterinoslav at the Auerbach Mining Works, in the Bachmut district, where there are three cinnabar shafts—the Sophia, the Zhelernyansk and the Chagarnsk, which yielded about 90,000 tons of ore in 1910, from which about 360 tons of quicksilver were extracted. Besides these mines, others are also to be found in the Kyurinsk district, Daghestan province, in the Caucasus; in the Urals, at Nikolai-Pavdinsk, on the River Pravyanka; and in eastern Siberia, in the Transbaikal province, on the upper reaches of the River Ildikan. Apart the Auerbach company, the quicksilver mines are not being exploited now, although this question is important, both for the Urals and for eastern Siberia, because of the great demand for quicksilver in the gold industry. According to report (*Min. Journ.*, Feb. 11, 1911), in the northern part of the Primorsk province, on the upper Anadir, rich deposits of cinnabar have also been found.

Coal Mining Department

The Important News Of Coal Mining. New Appliances, New Methods. New Fields, Colliery Engineering

Pancoast Disaster Verdict

SCRANTON CORRESPONDENCE

The coroner's jury, which has been investigating the Pancoast mine disaster, which took place at Throop, near Scranton, Penn., on the morning of April 7, and which resulted in the death of 73 men, returned a verdict on Monday, May 8, in which they declare that the loss of life might have been much less serious, or possibly that all of the men might have escaped if the engineer had been stationed permanently at the engine house where the fire started.

The jury declares that the loss of life was largely due to the fact that the management did not realize in time the seriousness of the fire that had started in the engine house, and that too much attention was given to putting out the fire and too little thought given to the safety of the men in the China vein.

The jury says it cannot condone the apathy of the management in concentrating all their efforts on the fire instead of immediately notifying the men.

The jury finds:

(1) The fire might have been fought on entirely different lines, with better results, from the gangway side. If this had been done, the loss of life would not have occurred. The mistake was a most unfortunate one.

(2) That the mining laws are lax and should be amended.

(3) That sufficient inspection was not given this mine by the authorized State representative, the mine inspector.

(4) That many innovations should be introduced about the mines for the health and safety of the men employed in the mines, which are not legally obligatory.

(5) That danger alarms and danger signals should be erected in mines.

(6) That the number of competent aggressive inspectors should be increased.

(7) That the State bureau of mines insist on inspectors doing their duty, under penalty of immediate dismissal, and that the bureau should exercise a rigid supervision over its inspectors.

(8) That five months is too long a time for a mine to be in operation without an official visit from an inspector.

(9) That there is no excuse for such delinquency, which is little short of criminal.

The verdict goes into an exhaustive discussion of the improvements which the jury believes can be made in further safeguarding the lives of the miners, and includes the following recommendations:

Elimination of combustible buildings; engineers at every engine house; more inspectors; installation of complete telephone systems and danger signals, such as fire alarms; familiarizing employees with the means of exit; organization of relief corps, and more thorough supervision of the conduct of the mine inspectors.

Handling Explosives Underground

In a paper read before a district mining institute, H. B. Jones, a practical miner of long experience said: "I have found that the following is the best and safest method to thaw or soften dynamite: I set my tea bottle on two pieces of rock high enough to place two mining lamps under said bottle, and let the tea or water become heated. Afterward, I place the bottle in a bag or sack in the bottom of my box and pile six or eight sticks of dynamite around the heated bottle; I then wrap a bag or some old paper around the explosives as you would a baby in a cradle on a cold day. I lock my box and go to my work and by the time I have drilled one or two holes my dynamite is thawed. In mentioning two mine lamps, I want to say that every successful miner carries two or three spare lamps in his box."

With reference to the preparation of a shot hole, Mr. Jones said: "In charging a hole with dynamite, I use a broom handle or straight piece of stick to push the dynamite to the back of the hole. In using fuse for safety, I place the fuse in the exploder a little more than half way and press with a knife or axe on the open end of exploder on said fuse. I then make a hole on the side of the dynamite with a sharp pointed stick and tie a string around the dynamite and exploder. I do this for two purposes; first, so that the exploder will not rub against the side of the hole in charging, and, second, so that I can pull out the charge by the fuse in case it has failed to explode. If the shot misses fire, it is, of course, understood, that the charge must not be tampered with for at least 24 hours."

Coal versus Oil

Upon the advice of Quartermaster General J. B. Aleshire, the Secretary of War has recommended to the House Committee on military affairs that the bill for the transforming of the transport "Thomas" from a coal- into an oil-burner be not passed. The secretary's investigation of the proposed installation of the "Thomas" with oil burners seems to have begun and ended with the quartermaster's office. Those who advocate oil as a fuel advance the following facts as an argument.

The bunker capacity of the transport is 1763 tons (coal), equal to 12,765 bbl. (oil) capacity. The vessel burned 4000 tons of coal on one round-trip voyage, or about 80 tons per day. The cost of coal fuel for the round trip is $16,488 divided as follows: 400 tons taken at Manila, $4.47 per ton; 600 at Honolulu, $5.50 per ton; 3000 at Nagasaki, $3.80 per ton.

It is further stated that 4 bbl. of oil are required to equal the efficiency of one ton of coal; the cost of 16,000 bbl. of oil being as follows: For 12,765 bbl. taken at San Francisco, 80c. per bbl.; 3235 bbl. at Honolulu, $1.25 per bbbl., a total of $14,256. This represents a saving of $2232 in the cost of fuel for one round trip.

In the cost of a crew, the estimate reduces the number of men employed from 38 for coal burning to 15 for burning oil; this represents a saving of $3600 per round trip.

Other advantages favoring the use of oil are set forth, such as increased speed, increased cargo space, and the expenditure of fuel costs wholly on American soil.

In opposing the use of oil, the quartermaster general states that one ton of coal is equal in efficiency to 5.847 bbl. of oil. In concluding his report, he further says, "We do not feel assured that oil-burning apparatus installed on our ship would always be so carefully and satisfactorily operated as to eliminate entirely the probability of an explosion, as the crews are practically without experience in the use of oil."

No miner should ever start his day's work before he has carefully examined his roof by pounding it with a pick or steel drill. Cap pieces for mine posts should always be cut at least 14 to 18 in. in length; it is advisable to have the caps cover the entire surface at the top of the prop. Many experienced timbermen advise placing the large end of the prop next to the roof.

Fortunes Lost in Welsh Collieries

Special Correspondence

Although wages and working costs are increasing, Welsh miners are getting less coal per shift. Disablement cases were almost doubled when new compensation act went into force.

Readers of the JOURNAL are aware that in South Wales, there has been during the last few months a struggle between capital and organized labor. Various stages in the proceedings have been marked by unusual bitterness, and even violent measures have been resorted to, the result being delay in the settlement of differences and a prospect that "peaceful settlement" will not be reported for some time to come. A survey of this industrial struggle in Mid-Rhondda has been issued in pamphlet form by D. A. Thomas, the managing director of the several colliery companies known as the Cambrian Combine; while it is not proposed here to enter into a discussion of the points in dispute between the Combine and the 10,000 workers affected, it is possible that some of the matters dealt with in the pamphlet may be of sufficient general interest to justify reproduction.

It appears that three years ago the Cambrian Trust bought a controlling interest in the Glamorgan company, a concern that had not paid any dividend on the ordinary share capital since its formation in 1892, while the dividends on the preferred shares were some 12 years in arrears. The $50 shares could then have been bought at a heavy discount; at one time they fell as low as $2.50 per share.

A Losing Investment

The Penohiwfer colliery is also cited as an undertaking acquired, upon which something like $250,000 has been expended, but for which there is now nothing to show but two holes in the hillside, surrounded by roofless buildings with crumbling walls.

Then again there is a Brittannic colliery, the last acquisition of the Cambrian Trust. Mr. Thomas says that though a sum, amounting to more than $1,000,000, has been spent upon the steam-coal collieries, the present company has during its history, only paid one small dividend of 1¼ per cent. to the ordinary shareholder, and upon the death of the late proprietor, who had lost nearly the whole of a large fortune in the concern, the shares might have been purchased at a heavy discount; in fact at a quarter of their face value.

In commenting upon these concerns the point Mr. Thomas seems to emphasize is that the leaders of the men who "appear to be very envious of the extension of the sphere of influence of the Combine" could have anticipated the Combine and acquired them "for a song—almost for the asking." In so doing they would have had a fine opportunity of putting their theories as to the management of colliery property into practice, and in the event of success attending the project would have brought the ideal of the nationalization of mines within the range of immediate and practical politics.

The Miners Had an Opportunity

Mr. Thomas urges that the miners themselves had here an opportunity, "acting on the coöperative principle, to have participated in the huge profits which they allege are made by South Wales colliery undertakings," and then he adds: "If it is contended that the Miners' Federation is so constituted that it cannot legally employ its funds in such enterprises and set aside a small portion, why could not the colliers if they are serious in the matter, have combined together and set aside a small portion of the enormous increase in their earnings during the past few years, as compared with what they were 10 or 15 years ago, and have purchased a few colliery undertakings as an experiment? Why, the aggregate increased earnings over the past 20 years would by now have enabled them, I believe, easily to have bought up all the collieries in the South Wales coalfield."

The chequered career of the Naval collieries since they were started three decades ago, is also referred to. The history of the first 10 years is of failure and disaster, the original proprietors having lost about $1,000,000 in the collieries. Several times this undertaking has changed hands and with one exception, the last, at considerable sacrifice. If the annual profits and losses since coal was first raised were set off against one another, there would be a heavy balance on the debit side, and that too without making any allowance for depreciation by reason of the gradual exhaustion of the coal. In other words, these collieries, finding employment for over 2000 men, have been worked since their commencement at an actual loss to the shareholders. The company has expended on improvements during the last two years $600,000 upon which nothing has so far been earned, and if they get ordinary fair play, Mr. Thomas says the output of the collieries will, during the next few years, be doubled, and employment be found for an additional 2000 men. However, the Naval collieries are now laid in, and as indicated, there appears to be little likelihood of any immediate settlement.

Two tables are given showing the proportionate cost of labor, stores, etc., and profit in 1887 and 1909, the comparison being based on "through" (run-of-mine) coal, that is "large and small coal" as follows:

TABLE A

	1887	1909
Percentage of net selling price of cost of labor per ton of "through" coal free on board ship Cardiff	46.94	59.25
Percentage of cost of stores, railway tolls and other charges	41.83	34.37
Percentage of profit	11.23	6.38
	100.00	100.00

Another way of putting the matter is to let the figure 100 represent the respective costs, profits and selling price in 1887 as follows:

TABLE B

	1887	1909	Percentage of Increase or Decrease
Cost of labor per ton of "through" coal	100	204	+104
Cost of stores, railway tolls, etc.	100	133	+ 33
Profits	100	92	— 8
Net selling price free on board ship Cardiff	100	161	+ 61

Wages Are Increasing

In South Wales, at any rate, production charges are increasing, whereas the individual capacity of the workman is on the decline. It is stated that the cost of labor per ton of "large" coal in 1908 when the average wage-rate was 60 per cent. above the 1879 standard, was about 2¼ times the cost in 1887, when the wage rate was about 3 per cent. above the standard, while the cost of stores, pit wood, rates and taxes and general charges increased very considerably. As Mr. Thomas explains, that does not mean that the average earnings of the workman doubled, for the reason that the output per man was about 50 tons less in 1908 than in 1887. The figures for the Cambrian collieries show that "if the cost of labor per ton of large coal be represented in 1887 by 100, the corresponding cost in 1908 would be represented by 262 and a fraction, or more than 2½ times as much, while the average output of large and small coal per person employed had fallen in the ratio of 100 to 76.40.'

After stating that the recent 20 per cent. dividends of the Cambrian collieries

is largely to be explained "by the fact that a considerable portion of its income is derived from investments in which the reserves have been placed, that its capitalization is a comparatively low one and its output large, though this has been much reduced by the operation of the Eight Hours Act." Mr. Thomas offers a further explanation in the following terms: "Our output, by reason of the heavy expenditure on the new sinking and on improved plant has more than doubled during the last twenty years. In 1909 our wages bill was nearly five times as great as it was in 1887. The fact remains that the profits per ton were less in 1909 than they were in 1887 (the profits per ton were in both years well under 25c.) but the quantity factor was doubled in 1909."

Quality of Coal Falls Off

Mr. Thomas explains how orders are being driven from South Wales, his first point being the loading of dirty coal and particularly of dirty slack. "Not very long ago the ash in small steam coal on incineration often showed a percentage of from 7 to 9 per cent.; now for the same coal it is often double that. The price of the best Welsh coal is exceedingly high in comparison with that of the North Country, Yorkshire and German coal, so much so that the big difference in price, together with the uncertainty of delivery in consequence of labor disputes, has unquestionably driven away many orders that would otherwise have come to South Wales. Even at the high prices, a large number of South Wales and Monmouthshire colliery companies cannot make both ends meet."

Throughout the coalfield there is a greater quantity of dirt sent out with the coal, "an inevitable result of extra hurry consequent upon the Eight Hours' Act." Large sums have been spent in the last decade by a number of companies in the erection of picking belts and yet the coal is no cleaner. This may be partly explained by the fact that in many instances the seams now worked are not so clean as those worked formerly; another explanation given is that some of the workmen "deliberately fill into their trains large lumps of what is known as iron pyrites, a substance frequently found in the best seams and which from its weight, even in an indifferent light, they must well know is not coal, but which they think will be weighed, passed and paid for as coal."

Another ground for complaint cited is "the organized action of miners in putting out less coal, often 30 to 40 per cent. less than they could put out, whenever a new seam is opened out and when they are working on a fixed day wage before the price list has been arranged." This is what is known as working "ca' canny" in order to try and prove that the seam is a difficult one to work, and one in which the miner can only produce a small amount of coal per turn. Mr. Thomas says, "The little game is always seen through and is so well known as to have little difference on the minds of those to whom the settlement of the price list may be referred."

Strong complaint is made by employers in South Wales of the carelessness of the workmen in carrying out the instructions of the colliery officials nuder circumstances of danger. An instance is given by Mr. Thomas. A fireman noticed a large piece of coal hanging over in a dangerous way and instructed the collier to put in a sprag. This was not done and before the day was out the coal fell and killed the man, to whose relatives the employer had to pay heavy compensation, though the man's death had occurred through disobeying the instructions given by the employer's representative. According to the evidence of a South Wales coroner such cases are not unique and summing up at the inquest he said: "If anybody had asked for trouble, deceased had, and unfortunately he got it. He lost his life because he had not taken a very obvious precaution."

Compensation For Accidents

Discussing the question of compensation for accidents, Mr. Thomas remarks: "Most of us have known cases where men have foolishly endangered their lives through laziness or for some other reason, and this tendency is likely to be increased where the person knows that in the event of his death his relatives will be provided for. Not many years ago a man who had at one time been a colliery workman, had both legs cut off by a Taff Vale train, and though it almost seems incredible it was afterward proved in court beyond the shadow of a doubt that he had deliberately placed his legs on the line in order to obtain the insurance money for which he thought he had fully provided."

There is a movement in the United States to establish a system of compensation for accidents among the miners and the experience as regards malingering in South Wales may not be without interest. It is all too prevalent among a certain type of men in the coalfield. The colliery companies in the Cambrian Combine found malingering so rife that it became necessary to employ a qualified medical man solely for the purpose of guarding their interests against malingering. They were denounced for employing a detective, but as Mr. Thomas says, "Honest men have no fear of a detective, and the results achieved by our medical man showed that his appointment was more than justified." It recalled that under the British Compensation Act of 1897, the injured workman received no compensation for the first fortnight. The Amending Act of 1906 provided that if the injury was such as to disable the man for above a week and under a fortnight, he is paid for all over a week. If the man is disabled for a fortnight or over, he is paid from the first day of the injury. The following are the figures given to show how the Amending Act increased malingering:

For the Six Months Ending June 30, 1907 (*before amendment*) *per* 1000 *men employed*

The number of cases of injured workmen who were disabled for more than a week and less than a fortnight were	18.89
Number of cases of injured workmen who were disabled for a fortnight and more	35.97
	54.96

For the Following Six Months Ending December, 31, 1907 (after amendment) *per* 1000 *men employed*

Number of cases of injured workmen who were disabled for more than a week and less than a fortnight	7.44
Number of cases of injured workmen who were disabled for a fortnight and more	69.26
	76.70

From the figures given it will be seen that the disablement cases extending over two weeks, were almost doubled immediately the Amending Act came into operation and it would not be easy to conceive that the working conditions so speedily altered to that extent, the suspicion being that the prevailing idea was to secure compensation. However this may be, Mr. Thomas says, "The Welsh miners are no better and no worse than the other classes of the community. There are good, bad and indifferent among them, as there are among miners' agents, colliery owners, members of Parliament and all other classes of the community."

Increases Cost of Mining

James E. Roderick, chief inspector of mines for Pennsylvania, has made a calculation of the increased cost of mining in bituminous mines if the proposed code to regulate such operations becomes a law and places it at 3c. per ton. Mr. Roderick estimates that the average yearly production of bituminous coal is about 150,000,000 tons, and if that figure be taken, the additional expense will appromixate $4,500,000. The chief says he bases his estimate on the careful study of the subject and first-hand information. "The bill was drawn," says he, "to give greater security to the safety of the miners and to the protection of property, and these requirements will add to the cost of mining."

The State of Ohio is particularly fortunate in never having had an explosion or other coal-mine accident which caused the death of a large number of men. Chief Mine Inspector Harrison says that over a period of 20 years, the accidents due to explosions caused 22 deaths, and the largest number killed in any one year was four. Falls of roof and coal killed 944; powder explosions and windy shots killed 89.

Tests with Explosives

Interesting data are contained in a paper read by Clarence Hall, explosive engineer, U. S. Bureau of Mines, before the Mine Inspectors' Institute of the United States. A few of the facts brought out follow: In 1902 there were only 11,300 lb. of short-flame explosives used in the coal mines of the United States; in 1908 there were 2,108,510 lb. of short-flame explosives used in our coal mines. In 1909 nearly 9,000,000 lb. of short-flame and permissible explosives were used.

In firing explosives in coal mines, the use of fuse and detonators does not yield as good results as the use of detonators fired electrically; at the same time, there is a serious objection to the use of this method in gaseous mines for the reason that the spitting of the fuse may ignite the gas.

Even when special igniters are placed at the end of fuse to prevent this spitting, the flame from the fuse has been known to burst through the side, which, of course, nullifies the effectiveness of this safety device when employed in connection with the character of fuse ordinarily used in coal mines. At the same time, a considerable quantity of the oxygen from the air is consumed in the burning of fuse, which necessarily vitiates the quality of the mine air.

When electric detonators are used, owing to the limited charge contained in these devices, the quality of gases produced by them under working conditions need not be considered.

Fire a Number of Small Shots

All field observations indicate that it is much better to fire a number of small shots successively than a few large ones. In the best practice, bore holes should be so drilled as to take all possible advantage of bands or partings in the coal bed, and after each shot is fired the coal should be loaded out before firing the second charge.

In charging permissible explosives when the cartridges are smaller in size than the diameter of the drill hole, the cartridges are often slit lengthwise and then tamped tightly into the holes; consequently, the charging density is increased and a greater disruptive effect obtains.

When a slow action is required, air spacing will materially lessen the quick action. Moist clay for tamping is being rapidly introduced and is now generally employed as tamping. This clay may be dug outside the mine and brought into the mine in mine cars and left at various points along the entry within easy reach of the miner. It is sometimes obtained inside the mine from the strata underlying the coal bed.

Coal cuttings and fine dust made by the coal auger have been used for tamping, but such practice is dangerous for, although this tamping might be wet, the heat generated even by the permissible explosives increases its liability to cause ignition. Wooden rods fitting the drill holes snugly should always be employed as tamping bars. The stemming should be loosely tamped near the explosive and tightly tamped in the remainder of the hole.

When the explosive is too quick acting for the coal, a plug of soft, tough clay is often employed to produce a small air space between the explosive and stemming. The charging density is accordingly less and the explosive force is reduced to such a degree as is best suited to the coal being blasted. In the event of this method being used, care must be exercised to tamp firmly the outer portion of the clay stemming.

One of the most important results secured in the use of permissible explosives properly fired is the absence of smoke. The ventilating current is not fouled by large quantities of dense smoke, as is the case when black powder is employed, and the roof can also be better inspected. Even permissible explosives, when fired in coal mines, produce colorless, poisonous gases, and the miner should not proceed to the face any sooner than he would when using black powder.

Gaseous Products Are Dangerous

The results of numerous tests indicate that the gaseous products of practically all explosives, together with the gases produced by the coal itself, are, without exception, extremely poisonous and inflammable. This accounts for the ease with which a miner can set fire to crevice gas by applying an open light immediately after a shot; however, this is a most dangerous practice and should be discouraged. It has been found that after 4 min., the greater volume of the gases generated have become diffused in the mine air.

From information received from a few of the coal operators, who have kept careful records of the cost of permissible explosives, there is little increase, if any, in the cost per ton of coal produced over that when black blasting powder is used. At the same time, the quality of coal produced is equally as good. It is true that these comparative figures are based, in the case of black blasting powder, on figures compiled when the miners were loading and firing their charges in a wasteful manner, while in the case of permissible explosives shot firers were employed, and the explosives were used in a more intelligent way.

In one mine where black blasting powder was used exclusively during the year 1909 and shot firers were employed, the average cost per ton of coal produced, including the cost of squibs and the wages of the shot firers, was 3.15c. The cost sheets varied from 5.54c. in March to 2.70c. in August. The cost of shot firing averaged 1.01c. per ton of coal produced. In another mine in the same district during the same period, using permissible explosives, the average cost per ton of coal produced, including cost of electric detonators and the wages of the shot firers, was 3.33c. In this case the average cost of shot firing was 1.22 cents.

Lehigh Coal and Navigation Company

This company owns a large coal estate in the anthracite region of Pennsylvania; it is the only large anthracite company which is not controlled by a railroad company. It owns the Lehigh & Susquehanna railroad, which is leased to the Central Railroad Company of New Jersey. It also owns several short lines built to connect with its mines. It holds controlling interests in the Lehigh & Hudson River and the Lehigh & New England railroads, both extending from the Delaware river to the Hudson. It operates the Lehigh and the Delaware Division canals, from Mauch Chunk to Philadelphia.

The company is oldest of all the anthracite companies, the report for the year 1910 covering the 90th year of its active operations. It is also the oldest mining company in the United States.

The report shows capital liabilities of $24,172,850 stock and $20,915,083 funded debt. Stock was increased $3,144,200 during the year by a stock dividend of 15 per cent., paid March 1, 1910. Since the close of the year the stock of the company has been increased to $26,587,650, by a 10 per cent. stock allotment at par, amounting to $2,414,650, to be subscribed and paid for May, 1911. The proceeds of this issue will be used to retire bonds which mature this year.

Coal Production and Income

The coal-mining statement for the year is as follows, in long tons:

	1909	1910	Changes
By company	2,828,788	3,375,541	I. 546,753
By lessees	224,927	285,822	I. 60,895
By Alliance Coal Co.	134,264	188,492	I. 54,228
Total shipments.	3,187,979	3,849,855	I. 661,876
Used at mines	397,671	409,083	I. 11,412
Total mined	3,585,650	4,258,938	I. 673,288

The quantity used at mines was 11.1 per cent. of the total mined in 1909, and 9.6 per cent. last year. Comparing this with the income statement we find that the earnings of the Coal Department were $2.574; expenses, $2.133; net earnings, $0.441 per ton of coal shipped. Expenses were $1.928 per ton of coal mined, including that used at mines.

The income account for the year is as follows:

	Receipts	Expenses	Net
Coal	$ 9,910,404	$8,212,127	$1,698,277
Canals	234,157	211,893	22,264
Railroads	2,352,622	67,370	2,285,252
Miscellaneous	144,930	6,202	138,728
Total	$12,642,113	$8,497,592	$4,144,521
General expenses and taxes			$ 520,066
Interest on funded debt			897,343
Sinking fund on coal mined			183,068
Depreciation			300,000
Total charges			$1,900,477
Surplus for the year			$2,244,044

Payments from surplus were $49,898 in adjustment of accounts and $1,931,744 for dividends of 8 per cent. on stock; leaving a balance of $262,402. Adding $748,203 brought forward from the previous year made a total surplus of $1,010,605 at the close of the year.

The railroad receipts included $2,199,884 received for rental of the Lehigh & Susquehanna railroad. The gross earnings of that line were $9,280,995; of which $5,030,295 or 54.2 per cent., were from the carriage of anthracite. Earnings of the short lines operated by the company were $152,738, or $75,370 more than the expenses. The company has 187 boats in operation on its canals. The total freight carried was 364,972 long tons, 323,808 tons being anthracite.

Mine and Other Improvements

Tamaqua breaker, formerly known as No. 14, was completed and put in operation in October last, and is now shipping about 50 per cent. of its capacity. It is expected that the underground workings will be in condition to increase this percentage largely during 1911, although the full capacity of the plant will probably not be reached before the summer of next year.

Work upon the Lausanne drainage tunnel has been carried on during the year, but owing to the necessity for driving certain openings to improve the ventilation, the progress was considerably behind that of 1909. The ventilating openings referred to have been finished, and it is hoped to complete the connection with No. 2 shaft level in the spring of 1912. This tunnel will drain a large area of the company's coal operations.

The company contributed to the employe's beneficial fund and for pensions during the year the sum of $32,621, which was included in operating expenses.

During the year plans were completed for the extension of the Lehigh & New England Railroad from a point on its line near Danielsville, Northampton county, Penn., to a point of connection at Tamaqua, Schuylkill county, Penn., with the tracks of the Panther Creek railroad of the Lehigh Coal and Navigation Company. This will give the company connection with the Poughkeepsie Bridge line, and a direct route for its coal to a large part of western New England.

Lignite Deposits in United States

By Joseph A. Holmes*

The extent of the lignite deposits in the United States will be realized from the following figures giving the areas in several of the States:

EXTENT OF LIGNITE DEPOSITS

	Lignite, Square Miles	Sub-bituminous, Square Miles
Alabama	6,000	.....
Tennessee	1,000	.....
Louisiana	8,800	.....
Arkansas	5,900	.....
Texas	53,000	.....
South Dakota	4,000	.....
North Dakota	31,000	.....
Montana	7,000	8,800
Wyoming	.....	21,360
Washington	.....	1,100
New Mexico	.....	5,000
Colorado	.....	5,910
Idaho	.....	1,200
	116,700	43,370

In a number of States in the Rocky Mountain region there are large areas of coal that represents a transition between typical lignite and bituminous coals. For these, the name "sub-bituminous coals" has been suggested, and is tentatively used by the United States Geological Survey.

The lignite beds in Alabama, Mississippi and Tennessee represent a transition between peat and the more typical lignites of the Dakotas and Texas. Little or no use has been made of the lignite beds in these three States.

The lignites in Texas and Arkansas have been used to a limited extent; as have also the lignites of the Dakotas and eastern Montana. In this latter field the lignites contain 20, and in some cases more than 40 per cent. moisture, and slack badly and rapidly on exposure to the atmosphere; and this quality seriously interferes with their use and value for fuel purposes.

The outlook for the utilization of lignites is favorable along three lines:

(1) In gas producers; without either drying or other treatment.

(2) In boilers of special construction; such, for example, as that installed more than a year ago at Williston, North Dakota, by the United States Reclamation Service, where lignite is used in its natural condition almost immediately after being brought from the mine.

(3) In the form of briquets. This requires that the lignite should be thoroughly and finely crushed and dried to a moisture content of from 5 to 10 per cent., and then compressed while still warm into briquets.

Limited quantities of lignite from California, North Dakota and Texas have been made into satisfactory briquets at the Government Mine Experiment Station at Pittsburg, using the full-sized German briquetting press, which develops a pressure of 20,000 to 25,000 lb. per sq.in. In the cases just mentioned the briquets were made without the use of any binding material, a sufficient amount of tarry material remaining in the dried and crushed lignite to serve as a bond to hold the particles together in the briquet.

It is believed that the investigations along this line will demonstrate the fact that the lignite in Texas, the Dakotas and Montana can be made into briquets on a commercial scale, and that in this form the lignite can be used as a substitute for other domestic fuel in these regions.

*Director of the Bureau of Mines, Washington. D. C.

Note—Abstract of address on lignite, delivered before the American Philosophical Society, Philadelphia, Penn., May 5, 1911.

Anthracite Mine Fire

Special Correspondence

Five lives were lost in the Boston colliery of the Delaware & Hudson Company, at Larksville, near Wilkes-Barre, Penn., on May 11.

Fire broke out in a section of the mine where rock miners were employed early in the evening, but it was got under control without much difficulty. About 11 men were at work in that section. After midnight the odor of smoke was detected and the alarm was given.

All the employees in the inside workings made their way from the Ross seam to the main gangway, but the smoke had become so dense that nearly all were overcome.

Several rescue parties, at the risk of their own lives, entered the workings and succeeded in taking out three miners. When brought to the surface, these men were quickly revived. The rescuers, returning to the gangway, stumbled over bodies of the dead.

Several of the rescuers were overcome by the smoke, and David Evans was prostrated. He was rescued by a fourth rescuing party.

A strike was inaugurated at the colliery on Tuesday, and only a small number of men were at work. Had the full force been engaged the loss of life would have been much greater.

So far as the investigation has gone as to the cause of the fire, it is said that a workman left a naked light in the shaft, which fired the timbers. The blaze quickly worked its way down the shaft timbers, sending the smoke into the various chambers.

The rescuers, with the use of dynamite, blocked the air current, and in this way entrance was gained into the chambers where it was known the five missing men were at work. The bodies of Feeder and Melodicka were found together. They started to work their way to the foot of the shaft, but were overcome by the smoke. An hour later the bodies of the other three victims were found 100 yd. from the chamber where they worked.

Smelting Conditions in Utah

SALT LAKE CORRESPONDENCE

Smelting conditions in the Salt Lake valley during the first quarter of the current year were not normal, but three companies were operating plants at Murray, Midvale, Garfield and Tooele, treating a large tonnage of ore of all classes from the mines of Utah and Nevada, also ores from Idaho, Montana, Wyoming, Arizona, Colorado and California.

The supply of lead-silver ores coming to the valley smelteries was below normal, as has been the case for some time, and is especially low at this season of the year, owing to the poor condition of the roads. At the beginning of May, the American Smelting and Refining Company's plant, at Murray, was running three blast furnaces out of eight on lead ores, not including the furnace on matte concentration operated intermittently. This is, therefore, about 50 per cent., or less, of the normal capacity.

MIDVALE OPERATIONS

At the United States Smelting Company's plant at Midvale, five out of six blast furnaces are smelting lead ores, the seventh furnace, a reverberatory, being operated from time to time. The tonnage from this company's Bingham properties has been increased which, together with custom ores from Idaho, Nevada and other points, brings the operations up to about 80 per cent. of the full capacity of the plant. The Huff electrostatic zinc concentrator is operating two shifts, handling middlings produced in the company's wet mill, which is treating 250 tons of ore daily. A clean separation is made of the iron, lead and zinc, the last being shipped to eastern points, while the first, which carries practically all of the gold, is used as a flux in the lead furnaces. The copper ores that are produced by this company are shipped to the American Smelting and Refining Company for treatment, as the baghouse for the United States copper plant has never been built.

The zinc plant was installed as an experiment, but has proved so successful that its capacity has been increased. At present it is one of the principal sources of revenue of the company at Midvale. There has been an increase in the production of ores containing zinc from Utah and the adjoining States, some of which is also being treated by the Grasselli Chemical Company at Park City.

The work of tearing down the old Bingham Consolidated smeltery at Midvale has been in progress for some time. The materials used in the construction are being disposed of. H. H. Green, who is making a cleanup around the smeltery, is preparing a shipment, which will run well in copper, gold and silver.

The copper smeltery of the American Smelting and Refining Company at Garfield is running at about the same capacity as at the beginning of the year, smelting between 2500 and 3100 tons of charge daily, about two-thirds of which represents ore and concentrates.

The Silver City plant of the Utah Ore Sampling Company is operating steadily and all the ore shipped from the south end of the district, as well as some ore from Eureka, is sampled there. This ore is transferred at times to the Murray sampler, to suit the convenience of the company.

THE TOOELE SMELTERY

At the International Smelting Company's plant at Tooele an increasing tonnage of copper ore is being smelted. Three of the reverberatories are in commission, and if ore continues to come at the present rate another furnace will be added. The three furnaces are working at maximum capacity, and are treating upward of 600 tons daily. Of this tonnage the Utah Consolidated is sending in 400 tons, having increased its shipments from 300 tons at the beginning of the year. The South Utah concentrates, amounting to about 70 tons daily and custom ores make up the rest. More ore will be received from custom shipments in the near future. It is thought there are good chances of operating the five copper furnaces before the end of the year. The fourth reverberatory is ready to be warmed at any time, and the fifth furnace can be put into shape without much difficulty.

Work has been started on the two new lead furnaces, the grading being about half completed. Bids are being received for the supplies and equipment required in the construction, and contracts will be placed shortly. The company is accumulating a good tonnage of silver-lead ores so that there will be about six months' supply on hand, when the new furnaces are ready to begin operations in the fall. A number of contracts have been made for ores of this character.

In addition to the Daly-Judge agreement, three other contracts are reported. The International is getting ore from the Cliff mine at Ophir, which at present amounts to 60 or 70 tons daily, and may be increased; also from the Bullion Coalition, formerly the Honorine at Stockton, and from the Lion Hill Consolidated at Ophir which has recently started to ship. The International appears to be in earnest in going after the lead business, and is willing to contract for all the lead ores obtainable. The International is meeting with much success in securing this class of ore. In addition to Utah ores, it will receive custom ores from Idaho and Nevada points. The company maintains that it will have an entirely modern plant, and will be better equipped to smelt lead ores than some of its competitors.

A partial solution of the lead ore shortage has often been suggested by the tapping of the Deep Creek country by a direct railroad line to Tintic, which if continued on to Ely would pass through or near several old lead camps. It is reported that conferences have been held by the International with the Western Pacific with a view to getting a branch line extended into Deep Creek, and though the subject of a Deep Creek road is somewhat threadbare, there seems to be an impression that this branch will be built. At the present price of lead many properties not on a railroad can not ship to advantage, which accounts in part for the smaller tonnage of this class of ore being received in the Salt Lake market at present, as compared to what it was a few years ago when the price of lead was higher.

Minnesota Iron Notes

DULUTH CORRESPONDENCE

A trainload of ore from the Cuyuna range, consisting of 75 cars and containing about 5000 tons of ore, was shipped from the Kennedy mine, May 4, and met with an accident about 15 miles from its destination. The hopper doors on a car near the rear of the train worked open and gradually permitted the ore to pile on the track in sufficient quantity to derail 15 cars. The ore will not be dumped direct into the dock for the present, as the approach is not complete, but the trains will be held in the Superior yards for several weeks. This entrance of the Cuyuna into the ranks of the shipping ranges has been patiently awaited by those having interests on this range and it is believed will stimulate activity in exploration work there for some time to come.

The Roy Development Company, operating on the Vermilion range, is conducting negotiations with John T. Jones, of Iron Mountain, relative to the installation of a Jones furnace at their property on the Vermilion range. The Roy mine has quite a tonnage of banded ores and it is this kind of ore which is giving the best results in the treatment by this process. Previous to the actual installation of the furnace at the Roy property, experiments on a commercial scale will be conducted on the Roy ores at the furnace which is being erected at the Kloman mine in the Republic district in Michigan. Ore will be shipped from the Roy mine for this purpose and final negotiations will depend on the outcome of these experiments.

The Universal Portland Cement Company, a subsidiary company of the U. S. Steel Corporation, is planning to erect a 4000-bbl. plant in Duluth for the manufacture of portland cement. The site of the plant adjoins that of the Minnesota Steel Company, now under construction in West Duluth.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Henry F. Lefevre left New York last week and will be in Colombia and Venezuela about two months.

Charles Earley has returned to Los Angeles from a trip of mining inspection in Washington and British Columbia.

C. A. O'Connell, formerly of the Green Meehan mine, has been appointed manager of the Trethewey mine, Cobalt, Ontario.

C. F. Dike, of Cripple Creek, Colo., has been appointed manager of the Crown Chartered mines in Porcupine, Ontario.

J. B. Tyrrell, of Toronto, is making an examination of the property of the Swastika Gold Mining Company in Northern Ontario.

W. H. Trewartha-James, general manager of the Tyee Copper Company, Ltd., is back at Victoria, B. C., from a business visit to England.

H. H. McLaughlin left Panulcillo, Chile, on April 17, and is now in London *en route* to the United States on a five-months' vacation trip.

Ralston Bell, of Edinburgh, Scotland, has gone to the Ivory coast, West Africa, for the French West African Company. He will be absent about a year.

W. G. Page, of Los Angeles, and F. M. Myers, of Seattle, Wash., are making an examination of the Wilson Mesa placer, near Moab, Utah, for Oakland people.

H. DeC. Richards, managing owner of the Orleans Mining and Dredging Syndicate, in Humboldt county, Cal., has been making a business trip to Los Angeles.

Anthony J. McMillan, manager of Le Roi Mining Company, Ltd., is at Rossland, B. C., after having spent several months in the eastern States and England.

Robert H. Stewart, general manager of the Consolidated Mining and Smelting Company of Canada, Ltd., has returned to British Columbia from a visit to Los Angeles.

Henry C. Beeler, formerly State geologist of Wyoming, has removed his office as consulting mining engineer to 1004, First National Bank building, Denver, Colorado.

Wakely A. Williams, superintendent of the Granby Consolidated smeltery at Grand Forks, B. C., recently visited New York to confer with the directors of the company.

George C. Bayless, of Carterville, has been appointed inspector of lead and zinc mines of Missouri, in place of Charles P. Wallace, who has resigned on account of ill health.

A. J. Condee, Los Angeles, Cal., has gone to New York to close a sale of the Three Friends Mining Company's holdings at Solomon, Alaska. The property is owned entirely in Los Angeles.

Philo D. Grommon, of Golden, Colo., has been appointed superintendent of the Ophir Gold Mining, Milling and Power Company at Ophir, Colo. This company recently bought the Suffolk and some adjoining mines at Ophir.

C. J. Adami, for the past four years superintendent of mines for the Federal Lead Company, has resigned, and has been appointed assistant general manager and superintendent of mines of the Doe Run Lead Company at River Mines, Missouri.

George Gordon Crawford, of Birmingham, Ala., president of the Tennessee Coal, Iron and Railroad Company, who has been traveling abroad on his wedding trip since February, spent last week in New York and has now returned to Birmingham.

George W. Whitehead, for several years past with the Lackawanna Steel Company, Buffalo, N. Y., has been appointed metallurgist for the company in place of Dr. G. B. Waterhouse, who will hereafter devote his time to research and experimental work for the company.

Prof. Nathan F. Dupuis, dean of the Faculty of Practical Science, has resigned, after a service of 45 years on the teaching staff of Queen's University, Toronto, Ont. Professor Dupuis was 75 years of age on April 13, and after a strenuous life he feels the need of rest.

Dr. James Mackintosh Bell has been chosen president of the Australasian Institute of Mining Engineers. Doctor Bell recently resigned his position as director of the Geological Survey of New Zealand, and has been engaged in examining some mineral concessions in New Caledonia.

D. C. Bottin, State inspector of coal mines, Seattle, Wash., and J. B. Warriner, mine inspector, Northwestern Improvement Company, Tacoma, Wash., were at Nanaimo, Vancouver Island, B. C., where they were shown about local coal mines by Francis Shepherd, chief inspector of mines for British Columbia.

OBITUARY

James Smith died in New York, May 15, aged 53 years. He was born in Cleveland, Ohio, and had been for 38 years with the Standard Oil Company; for over 10 years he had been chairman of the manufacturing committee. He was the first to refine Texas oil successfully.

Capt. Samuel J. Dennis died at Arlington, N. J., May 15, aged 69 years. He was born at Arlington, but went West when a young man and was for many years engaged as a miner and mining engineer in Colorado and Montana. For some time he was at the Clark mines in Butte.

Benjamin Hirsch, grandson of the founder of the firm of Aron Hirsch & Sohn, Halberstadt, Germany, died suddenly on May 11, at Karlsruhe. He was born in 1840 and started in business as a very young man. He traveled extensively and enlarged the business relations of his firm in all parts of the world. In the early sixties he was one of the metal merchants who brought about the formation of a lead exchange in London, out of which afterward grew the London Metal Exchange, and at the time of his death he was the only non-resident member of the London Metal Exchange. He visited this country several times, the first time in 1893, and repeatedly since the establishing of their agency in this country in 1897. He was a recognized authority on statistics and was a member of the German Imperial Board of Statistics.

SOCIETIES and TECHNICAL SCHOOLS

Missouri School of Mines—The fortieth annual commencement of this school at Rolla will be held on May 26. Dr. J. A. Holmes, director of the Bureau of Mines, will deliver an address on "The Individual, the State, and the Nation in the Development of our Mineral Resources."

American Institute of Chemical Engineers—The third semi-annual meeting will be held at Chicago, June 21 to 24. Headquarters will be at the Congress hotel. The program provides for sessions for business, the reading of technical papers and discussions, and for visits to a number of chemical and industrial plants in Chicago and vicinity. The local committee of arrangements is: A. Bement, chairman, 206 La Salle street, Chicago; P. C. Brooks, secretary and treasurer, Hegewisch, Ill.; Oscar Linder, T. G. Wagner.

Missouri Mining Association—This association was recently established at the Missouri School of Mines, at Rolla. The purpose of the organization is "To advance the knowledge of mining among its members; to promote good fellowship among the students, alumni and others interested in mining; and to bring the School of Mines into closer relation with the mining profession at large." The membership consists of three classes: Active (junior and seniors), alumni and honorary. Alumni and honorary members are not required to pay dues. At a special meeting on March 28, the association heard an address by one of its honorary members, Dr. E. R. Buckley, formerly president of the American Mining Congress. Dr. Buckley's subject was, "The Importance of Geology to Mining Engineers."

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

May 10—The reputed agreement between the representatives of the United States Steel Corporation and the Risdon Iron and Locomotive Works by which the Risdon continues the operation of the plant for a term of six months from the date of the sale does not appear in the deed of conveyance dated and ratified by the board of directors May 1, but is said to have been written in a separate form at the request of A. T. DeForest, Pacific Coast manager of the American Steel and Wire Company, in whose name the option of purchase was made. The purpose of this temporary continuance of the Risdon operation is presumably to allow time for the completion of unfinished construction orders contracted previous to the delivery of the option to Mr. DeForest in March. In this period of waiting for actual and active possession of the premises the purchasers will have opportunity to develop plans for such establishments at this point as may be found practicable and of economic advantage, the details and extent of which will depend somewhat on the result of the options taken by the same interests at Portland and Seattle. The Portland option which is said to be written for expiration on May 24 contemplates the purchase of 700 ft. of water frontage on the north side of the Willamette, in what is known as North Portland, in the vicinity of the deep-sea vessel landings. At Seattle the site considered (whether by option or purchase is not definitely stated), is that of Moran & Co., who own a ship-building plant and drydock. There is much speculation here as to the ultimate purpose of the Steel Corporation, which, of course, has not been divulged by representatives of the subsidiary corporations who have conducted the negotiations. Whether or not the manufacture of structural steel and ship building is to be the ultimate purpose of the establishment of the corporation by land and plant purchase the fact is known that these or similar negotiations have been in progress for the last two years.

If the purpose is the manufacture of steel there is small likelihood that two such plants as the Risdon at San Francisco and the Moran at Seattle would both come into possession and use, with an additional distributing plant at Portland. Nor is it apparent that three distributing depots on this coast are essential to the trade in the Pacific Coast States. As to the possibility of the economical manufacture of steel and pig iron in California from iron ores occurring in the State there is no further question, and whether it be done on a large scale will depend without doubt upon the big corporations. The former failures have to some extent resulted from the labor situation and fuel costs. Neither of these obstacles would interfere in the future under the operation of such a combination as is represented by the purchase of the Risdon. The successful manufacture of both pig iron and steel by the electric process has been theoretically demonstrated by the Noble Electric Steel Company and five electric furnaces will be producing in July. As to the abundance and quality of iron deposits in both northern and southern California there is no question whatever.

Butte

May 10—The amount of copper produced by the Butte district for April was 21,156,150 lb. The production of the various companies was as follows: The subsidiary companies of the Anaconda company, including the Boston & Montana, 5,971,200 lb.; Anaconda, 6,450,750; Butte & Boston, 774,000; Washoe, 658,800; Parrot, 688,200; Trenton, 708,000; Butte Coalition, 1,809,000; Original, 1,228,50. The independent Butte companies produced as follows: North Butte, 1,628,700 lb.; East Butte, 969,000; Tuolumne, 270,000. The production for March exceeded these figures by 365,910 pounds.

Denver

May 12—After a stormy session of 124 days the legislature adjourned Saturday, several bills affecting mining having been passed. Van Tilborg's tunnel-drainage bill was passed; also, O'Connell's bill empowering the State to regulate smelting and reduction companies. This bill will be submitted to a vote of the people at the next general election.

Labor organizations have been trying to get an effective eight-hour law for 12 years. The new measure will affect 25,000 miners of the State and applies to tunnel workers as well as miners. The employers' liability bill is practically the same as the measure the constitutionalty of which was questioned because the journal page with the vote on final passage was "mislaid" and later found in another part of the journal after an investigation had been started. The operators succeeded in getting passed a number of amendments to the mine-inspection bill, but it will cause more and better inspection and result in improved conditions in the mines if it is obeyed.

Thomas Henahen, of Silverton, was appointed by Governor Shaffroth as Commissioner of Mines. Mr. Henahen is an old mining man and has for years been active in the management of San Juan properties.

The directors of the Roosevelt Deep Drainage Tunnel Company have decided that no new development will be done for the present, at least. There was some talk of extending the bore 2000 ft. from the present heading, but as the cost would be $40,000 and the tunnel is draining the district, although at a slower rate than was anticipated, the directors believe it would not be wise to spend any more money on development until it has been proved that the present tunnel will not do all the work expected.

Salt Lake City

May 12—According to statistics collected by the National Copper Bank, of Salt Lake City, based in part on shipment figures from the railroads, the various Utah camps produced as follows for the first quarter of the year: The Tintic district has the greatest number of active properties at this time; the principal producers are the Centennial-Eureka, Iron Blossom, Colorado, Uncle Sam, May Day, Sioux Consolidated, Dragon, Gemini, Victoria Consolidated, Grand Central, Mammoth, Gold Chain, Black Jack, Carisa, Opohongo, Beck Tunnel, Lower Mammoth, Eagle & Blue Bell, Scranton, Bullion Beck & Champion and Yankee. These mines shipped 92,530 tons of ore during January, February and March. From the Bingham district the Utah Copper, Bingham-New Haven, Utah Consolidated, Utah Apex, United States Mining Company, Bingham Mines, Ohio Copper, Yampa and others, including leasers now operating, produced, milled and shipped 1,137,581 tons of ore during the first quarter of the year. When the Bingham & Garfield railroad is completed, which is expected to be before the close of the summer, the Utah Copper will be enabled to increase its shipments from 12,000 to 20,000 tons of ore daily. The Park City district shipped 28,534 tons, since Jan. 1, which is an increase of approximately 4000 tons over the first quarter of 1910. The Silver King Coalition, Daly-Judge, Daly West, Little Bell, New York, Silver King Consolidated, American Flag and the Ontario and other leases were the principal shippers.

Beaver county shipped 8100 tons to the smelteries during the first quarter of 1911. The active properties in this section include the Cedar-Talisman, South Utah, Horn Silver, Moscow, Majestic, Red Warrior and Hub. The Ophir district has sent out 4400 tons of ore, in spite of bad winter roads. Considerable active development is being carried on in the camp, and a number of the old properties on Lion hill have been consolidated, and have resumed operations. Little ore has been sent down from Alta or Big Cottonwood, owing to the impassable condition of the roads. At Mercur, the Consolidated Mercur Gold Mines Company has treated 700 tons a day, including ore and some of the early tailings, or above 60,000 tons for the quarter. The camp of Stockton is doing some development, and making occasional shipments, as is Fish Springs, and some of the smaller camps and detached mines. The mining outlook is encouraging. Development work is in progress in all the camps, and a larger tonnage is looked for than in several years. Including the above figures, and properties from which no record of production was obtained, the total estimated tonnage of ore mined during the first quarter of the year amounted to 1,331,000 tons. A metal yield in the neighborhood of $35,000,000 is looked for in Utah during 1911.

Marquette, Mich.

May 1—About 60 of the 100 ore cars ordered by the Lake Superior & Ishpeming road from the Clark Car Company of Pittsburg, a year ago last fall, have been shipped from the factory, and they are being placed at various sidetracks along the line as they arrive. Several of the new cars are now in the yards at Marquette, and as they are considered the last word in ore-car construction, they are being examined with a great deal of interest. Rapidity of dumping is the feature of the new cars that marks the greatest departure from the style of ore cars now in use. Though steel practically replaced wood in the construction of ore cars several years ago, it is only within a comparatively recent time that any improvements have been made, the object of which was to facilitate the dumping of the loads.

The Lake Angeline mine at Ishpeming is said to have turned out more mining captains during the last 15 years than any other mine in the Lake Superior region. A list of names recently given out, includes 32 men who are now holding positions as mining captains at various localities on the Michigan and Minnesota ranges.

It is the expectation on the Gogebic range that, while the Lake Superior region as a whole possibly will show a falling off in shipments this year compared with the outgo in 1910, the Gogebic range will send out fully as much ore this season as in 1910. The production last year was 4,315,000 tons, the largest in the history of the district.

F. J. Webb, of Duluth, who was recently appointed general superintendent of the Lake Superior mines of the Republic Iron and Steel Company was in Iron Mountain not long ago inspecting the properties of the Antoine Ore Company. It is expected, that as a result of his visit mining operations will be resumed at the Antoine mine at an early date.

Houghton, Mich.

May 11—Both Gratiot and Seneca, Calumet & Hecla subsidiaries, have closed down, and it is believed that this policy will extend to other properties, regardless of whether or not they are under this management. It is more than probable that the Atlantic mine will be closed soon, and in the event that the Calumet & Hecla is successful in completing the merger, there is every reason to believe that the Tamarack will be closed. Probably at no other time in the history of this district, or at least for many years past, has the general outlook and sentiment been so cheerless.

Birmingham, Ala.

May 8—Announcement is made here that Alexis W. Thompson, formerly president of the Republic Iron and Steel Company, now president of the Inland Steel Company, has been appointed by the merger committee, which is working out the plans for the consolidation of the Alabama Consolidated Coal and Iron Company and the Southern Iron and Steel Company, to verify appraisals of the steel mills and furnaces of the two companies. The merger plans have about been completed and the details are being worked out.

Cobalt

May 12—During April, 20 Cobalt mines shipped a total of 1980 tons of ore, which is a greater production than for any month of the current year with the exception of February. Shortage of power has been a serious factor in curtailing the shipments, but the mines are now well supplied and production for the future will probably be above the average of last year.

Surface prospecting on the Nipissing property has been started for this season. For the present the work will be confined to that section which adjoins the Savage mine where the McKinley-Darragh has been obtaining such good results. An interesting feature of the operations this year will be the prospecting by hydraulic methods. A 700-h.p. turbine pump has been ordered and will probably be installed by the end of June. The Nipissing has an area of 846 acres, only about half of which has been prospected and should the hydraulic method prove adaptable, it will open a large field for future operations.

The large coffer dam, 100 ft. long, at the foot of Lake Temiskaming, was washed away, during a period of high water in the lake, which was over 13 ft. above low-water mark. This dam was built to allow the construction of the permanent dam, one of a series designed to control the flow of water in the Ottawa river, and eventually in the Georgian Bay canal. This accident has resulted in considerable damage, and will be a severe set-back to the completion of the work.

Navigation is now open from Fredrickhouse to Hills Landing, in the Porcupine district, and launches are making regular trips. The large amount of surface water will seriously hinder operations for some time, and in most places, it is as yet impossible to do any surface prospecting. During the last week, new mining companies having an aggregate capitalization of $9,500,000 received charters.

The annual report of Hon. Frank Cochrane, Minister of Lands, Forests and Mines for Ontario, for the fiscal year ended Oct. 31, 1910, shows a revenue of $327,160 from sales and leases of mining lands; $246,529 from royalties; $84,059 from mining licenses, and $109,622 from recording fees.

London

May 10—The Gold Fields of Mysore and General Exploration Company is under the control of the oldest firm of mining engineers in London—Messrs. John Taylor & Sons—and owns a large extent of territory on the Kolar goldfield of India, and is interested in most of the mines, but of late, the company has been searching for pastures new and a number of Russian gold properties were offered, but after examination were rejected on account of transportation difficulties, or the terms were unsuitable. Now the company has secured an interest in the Uralia gold-dredging company in New South Wales, which is likely to pay well. The company also owns a share in another gold-dredging property in Bolivia, and this dredge is expected to be at work early next month.

The Whim Well copper mine, in West Australia, is about to erect a Murex magnetic plant to treat 200 tons per day of either oxide or sulphide ore. Experiments show a saving of from 80 to 93 per cent. on trial lots. The bottom of the mine is opening up well. During the first quarter of this year 1738 tons of 15½ per cent. copper and 2511 tons averaging 5 per cent., equaling 395 tons of fine copper were produced. At surface there is a dump of between 50,000 and 60,000 tons awaiting treatment.

A cable from the resident engineer of the Ettadoom concession at Tarkwa is to the effect that the Abosso No. 2 shaft has cut high-grade ore, and footwall not yet met with.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

The "Corwin," the first steamer to leave for Nome and St. Michaels, sailed from Seattle May 10; the next steamer will sail June 1.

Tillicum—Some high-grade ore has been discovered on this property near Fairbanks, and preparations are being made to work the claims on a larger scale.

Scandia—Development work will be done this season, by manager T. D. Corlew, of Seward.

Alaska-Treadwell — For the month ended April 15, 52,052 tons of ore were milled for a realization of $105,988 at an operating expense of $95,890. For construction $10,013 was spent.

Kenai-Star—This company has acquired the Logman property on Palmer creek, near Hope, and will build a stamp mill.

Rainy Hollow—The first shipment of copper from these mines, near Haines, was made recently.

King Group—This property has been taken over by Daily, Drank & Co., of Valdez, and will be developed under the name of the Mohawk Mining Company.

Glacier—This property, near the head of Mineral creek, has been sold to A. G. Brown and M. S. Griffith, of Valdez.

Great Northern Development Company—This company, under the direction of E. F. Gray, Copper Mountain, had about 40 men employed during the winter, and they report ore in large quantities. The property is only a short distance from the Copper River & Northwestern road.

Arizona

Gila County

Miami—The mill is running at half capacity. The saving at present is about 75 per cent., and it is considered certain that this recovery will be increased in the near future. Units 1, 2 and 3 are running evenly and are handling about 1500 tons of ore daily. Unit No. 4 will begin operating about May 20. The value of the concentrate, of which a 50-ton carload is being shipped to the Cananea smeltery daily, is above 39 per cent. copper. In every detail the underground work is proving satisfactory and no difficulty is anticipated in starting the settling of the capping. The power-controlled door recently finished at the ore pocket is successful in operation. The huge ore pocket constructed of concrete and lined with steel and timber is 75 ft. deep, 14 ft. wide, and 25 ft. broad.

Superior & Boston—Fair progress is still being made on the 1000-ft. level, where the north crosscut from the McGaw shaft being driven to explore the Old Dominion fault, and the southwest drift from the crosscut following the Great Eastern vein are making satisfactory speed through the quartzite. The north crosscut should not be far from the vein at present, and the Great Eastern vein has already been cut, although because of the vein's irregular trend the drift is not now in vein matter. On the higher levels the vein was characterized by a fold that swung to the north and returned. When encountered on the 1000 at a distance of about 50 ft. from the crosscut one side of the fold was cut by the drift which was carried along its regular southwesterly course, it being considered certain that the vein would again be encountered where it returns from its northern curve and resumes its general strike.

Old Dominion—During April the Old Dominion concentrated 11,085 tons of ore, smelted 29,275 tons of charge and produced 2,515,000 lb. of copper. Because of opening large bodies of concentrating ore in the United Globe ground the Old Dominion company finds it necessary to enlarge the present concentrator. Definite plans have not yet been formulated, but present indications are that another 500-ton unit will be found necessary. The management is now installing an additional set of 36x16 rolls and an additional 6-ft. chilean mill. The new high-line connection with the Arizona Eastern railroad's main track will be completed and ready for operation before July 1. This will be a decided improvement in the company's transportation facilities, as the grade into the works will be reduced from 4 per cent. maximum to 2.8 per cent. maximum.

California

Amador County

Central Eureka—In the year ended April 1 the 40-stamp mill crushed 16,423 tons of ore of an average value of $3.63 per ton. The shaft had reached 2870 ft. depth, and sinking continues.

Rose—Water encountered at the 300-ft. level in this mine at Sutter creek may necessitate installation of an improved pumping system. L. R. Poundstone, owner.

Calaveras County

Lightner—The directors of the Lightner Mining Company have levied an assessment of 5c. per share on the stock, said to be for the purpose of taking appeal on the judgment of the Superior Court awarded to James V. Coleman of $140,000 for tresspass on the Angels mine. It is said that the suit will be further complicated by a levy on this amount by Coleman to be applied on the judgment.

Imperial County

S. L. Packwood and Fogarty & McClintock are sinking shafts on their claims on the Beach line east of Brawley in the belief that they will find the sand or gravel at bedrock rich enough to warrant development.

Gold Beach Dredging Company—San Diego capital has become interested in prospecting the new placer field near Brawley. A dredge will be operated should the sand prove of sufficient value.

Kern County

The placer deposits north of the Black Hawk mine, in Rand district, have been taken on an option of purchase by northern California capital for 60 days.

King Solomon—Recently 4½ tons of ore cleaned up at the Red Dog mill at Johannesburg gave $240 per ton gold, almost double the highest estimate placed on the millrun. This ore came from a shaft and a drift at 50-ft. depth out of an irregular vein varying from 5 to 15 in. Ore from this mine milling $170 per ton was treated in March. The owners of the mill purchase the tailings from these rich ores and cyanide them at a profit; some run as high as $25 per ton.

Josephine T. G.—At the Osdick mill 23 tons of ore from this group gave an average plate recovery of about $35 per ton. The ledge in the breasts of the present drifts and crosscuts is 2 ft. wide.

Butte Lode—Leasers on this mine are shipping to the Red Dog mill and getting high returns. The veins are irregular and the mineral is in pockets.

William R.—C. A. Burcham, vice-president of the Yellow Aster, has taken a bond on this mine at $15,000. A strong vein of 2 ft. has been developed.

Merced—This mine in the Rand district has been sold to T. W. Atkinson, owner of the Sunshine.

San Luis Obispo County

Sierra Morena Mining and Refining—This corporation, owner and operator of the quicksilver mine formerly known as

the Klau, 17 miles west of Paso Robles, has rebuilt the furnace sheds and other buildings destroyed by fire in November, and will be ready for production this summer. H. De C. Richards, Crocker building, San Francisco, manager.

SHASTA COUNTY

Mount Shasta—This former gold producer recently bonded to Theodore Burkhart, of Portland, will be immediately unwatered. The mine has been idle for six years.

Balaklala—Two furnaces and converters are running, and the Cottrell process is doing fairly good work. There is less complaint from the farmers. most of whom recognize that the company is doing all possible to control the fumes. Frank L. Sizer is superintendent, under general supervision of E. B. Braden, of the Selby company, who succeeded Mr. White as general manager. This change in managers does not indicate, as locally reported, any change in the relations of the Selby and Tacoma companies with the Balaklala ownership and control.

Mammoth—This smeltery is still running three furnaces and successfully operating the baghouse.

Original Quartz Hill—This quartz mine near Old Diggings will be operated by the Mammoth under lease for fluxing ores. This will require resumption of the branch railroad from Cuargo.

Colorado

CLEAR CREEK COUNTY

Wilcox Tunnel—The working force is gradually being increased and within a short time 50 men will be employed. Heavy shipments of both smelting and concentrating ore will be made as soon as the Argentine Central railroad is opened for traffic.

GILPIN COUNTY

Since the construction of the new concentrator and the operation of the smeltery at Golden, many of the old-time properties that have been lying idle for years in the Central City district are now on a paying basis.

Champion Trio—The company shipped 15 tons of ore from the 850-ft. level.

Egyptian—Leasers, Anderle & Co., shipped 14 cars of mill ore from the 300-ft. level. Kramer Brothers, also leasers on this property, shipped 100 tons of screenings.

Trilby—Van Tilborg & Oleson, who have a lease on the 1300-ft. and 1400-ft. levels of the Trilby, are shipping about a car a day of milling grade ore, most of it coming from the 1300-ft. level. The ground caved from the 1200.

New York Tunnel—This tunnel has been leased to local men. It passes through the Amanda, Romona, Wild Horse, Mountain, Tiger and Des Moines.

OURAY COUNTY

The George Crawford properties in the Red Mountain district consisting of the famous Yankee, General Guston, Joker tunnel and Genesee-Vanderbilt properties are reported to be undergoing a reorganization at a much reduced capitalization. H. Y. Russel will be in charge.

Revenue—On account of bad roads caused by snowslides the Revenue company has had to store 20,000 sacks of concentrates. It is reported that this company will work the Ophir tunnel in San Miguel county through the Revenue tunnel in Ouray county.

Gold Trio—J. H. Anderson has retired from the presidency of this company. The company discharged $20,000 worth of debts in April and will now commence work on the Grizzly Bear and Micky Breen.

Atlas—Prominent among the mines in this district is the Atlas in the Sneffles range. Development has been in progress for several years under charge of Fred Carrol. It is now planned by the management to connect the Atlas with the San Pedro. There is a 10-stamp mill on the property which will be enlarged.

TELLER COUNTY—CRIPPLE CREEK

Dante—Between 650 and 700 tons of ore was produced from the Nos. 1 and 2 shafts during April.

Anchoria Leland—Work on the dump on Gold hill has begun under direction of Superintendent Howbert. Five sets of lessees are working.

Isabella—In April, 34 cars were shipped from the Lee shaft, 26 billed out by leasers and eight by the company.

El Paso—The El Paso shipped 103 cars in April, the greater part of the ore coming from the upper levels, declared to be worked out long ago. The company has quit work in the heading of the Fuller crosscut and will now continue the drift upon the water course.

Elkton—The Elkton company has granted three leases in the last week to parties who have entered the Ida May claim on Raven hill, near the Jo Dandy. This property was recently acquired by the Elkton. The prospects for developing oreshoots are good, as several veins are known to dip into this ground from other properties.

Mary McKinney—This Raven Hill mine produced 250 tons of ore during April.

Stratton Independence—The Robbins strike on the 400-ft. level is 4 ft. wide and has been opened for about 30 ft. A shipment returned $120 per ton. The company, in crosscutting for the same vein on the 400-ft. level, opened six ft. of ore and the hanging wall has not been encountered. Grab samples from this strike assayed $25 per ton. On the 300-ft. level Giroux & Co., drifting on the Martha Washington vein, opened about three feet of ore which runs better than $30 per ton. This strike is south of the shaft. On the vein ore had never been found at this depth, and it is now believed the south end of the claim, lying next to the contact, will be the most active part of the mine. Another strike of importance was on the 700-ft. level also south of the main shaft. C. G. Gorman, of Victor, who ran a crosscut on the 300-ft. level to the shoot worked by Adams on the 400, has ore and the vein has now been opened 15 ft. The ore is of milling grade.

Idaho

COEUR D'ALENE DISTRICT

Idaho-Continental Mining Company—It is reported that a compressor plant and a 200-ton concentrator will be built as soon as the wagon road to Port Hill is completed.

Moonlight—The tunnel, now in 2400 ft., will be extended 1800 ft. farther to give a depth of 1200 ft. on the ledge.

Bonanza Copper—A contract for tunnel driving has been awarded.

Blue Bell—Work has been resumed on the tunnel and it is expected that ore production will begin this summer.

Indiana

GREENE COUNTY

The miners' examining board has held its first session in Jasonville. More than 500 miners were examined and received certificates. The board is composed of J. E. Barnhill, of Jasonville, and Calvin Miller and J. W. Wolford, of Linton.

Pierson—The mine tipple and buildings, three miles north of Jasonville, were destroyed by fire May 12, throwing 125 men out of work and entailing a loss of more than $10,000. The night watchman was away for the first time in months.

VIGO COUNTY

Four times as many miners as could be waited on by the board of examiners sought examination certificates during the last week. It is physically impossible to examine and qualify all the applicants in this county in the time allotted. The operators have closed several mines because they have refused to run their mines and risk paying a penalty of $100 per day because men without certificates are at work. Under the law from May 15 until June 7 the board must adjourn.

Michigan

COPPER

Mayflower—No. 13 drill hole is operating in a conglomerate formation and it is expected that it will reach the lode exposed in No. 11 hole last winter, within a short time. This drill is operating at a point about 1500 ft. north of the discovery hole.

Ojibway—The crosscut at the 1500-ft. level of No. 2 shaft has just entered the lode, but is not sufficiently opened to reveal conditions. although the breast of the crosscut shows some copper. The drifts in both directions at this level tributary to No. 1 shaft continue in good ground also the south drifts at the 650- and 800-ft. levels.

New Baltic—The shaft at this property is nearing a depth of 350 ft. at which point the second crosscut will be driven to the lode which is also about the depth that a rich drill core was taken in the drilling operations. The first crosscut was driven to the lode at 200 ft. but the formation was badly broken.

Mohawk—This property is noting a betterment in the copper contents of the rock in No. 3 and No. 4 shafts—also the lower works at its new No. 6 shaft are beginning to show a higher standard.

Lake—This company has cut the lode at the eight level with good copper showing. The opening of the lode at this point about 1200 ft. from surface with results about equal to the showing above, is decidedly encouraging for the ultimate success of the mine.

Hancock—This mine is shipping about 350 tons of rock daily to the Allouez-Centennial mills; stoping going on at two points. No official returns have been given out regarding the yield.

Winona—The mill has been stamping about 200 tons of rock daily, but no official figures as to the mineral yield have been announced by the management.

Marquette Iron Range

Barasa—The mine, which is an old one, is being explored by the Corrigan, McKinney & Co., but results of a particularly encouraging nature have not been met. One diamond drill is being operated.

Volunteer Ore Company—The company's new mine, in the Cascade district, not far from Negaunee, is slowly developing. There is already a small but excellent stockpile, most of which came from exploration conducted during the last winter. It is still too early to predict its future.

Imperial—This is the only other active property in this district, and is one of the Cleveland-Cliffs Iron Company properties. A new hoisting plant and new battery of boilers have been installed.

Mary Charlotte—This mine, in the Negaunee district, owned by the Breitung interests, has made large sales recently and the result is an increase of 100 men to the force. The company is also working the Breitung-Hematite and the Milwaukee-Davis mines in the same district, and the Baron mine, at Humboldt. Large stock piles have been accumulated at each property during the winter.

Minnesota

Cuyuna Range

Aloha Iron Mining Company—This company has recently been organized with a capitalization of 200,000 shares of par value $1. Its first drill is now being operated west of Crow Wing, a station a few miles south of Brainerd. The remainder of the company's lands lie west of Brainerd. David H. Lawrence, Two Harbors, Minn., is vice-president.

Vermilion Range

Section 30—It is reported that a new orebody has been opened during the last winter and that 2,500,000 tons have already been developed. About 1000 tons a day are being hoisted, and shipments will soon commence.

Adams Homestead—This tract is held under option by the Section 30 Exploration Company, and exploration work is going on under the direction of Capt. E. F. Bradt. Two diamond drills have been in operation all winter and machinery is on hand for shaft sinking.

Frederick Mining Company—This company has taken an option on some land in sections 2 and 3, west of the White Iron Lake Company, and exploration work will start at once.

Vermilion Steel and Iron Company—The plans call for a crosscut at a depth of 250 ft. if ore is not struck above that depth. If ore comes into the shaft above that depth, the shaft will be continued down into the orebody.

La Chance—Drilling has been resumed in hole No. 1, which was stopped a short time ago at a depth of 660 ft., but it is now planned to continue the hole for several hundred feet, with the hope of cutting another belt of formation.

Missouri

Joplin District

Mary C.—A. D. Hatten, of Webb City, has purchased an eighth interest for $20,000 in the Mary C. mine at Toms Station.

Wilcox Mines Company—The John Jackson mine at Chitwood produced 403 tons of concentrate in the month of April approaching the record made by the same mine many years ago.

Durby Lead and Zinc—The mine at Porto Rico recently made a weekly production of 200,000 lb. of lead ore.

Dunham & Howerton—This company in prospecting the B. M. Robinson land at Toms Station has struck 34 ft. of ore that will produce 70 per cent. concentrate and has six holes all in good ore. This is the richest strike made in the camp.

Joplin-Kentucky—This company which has a mine at Chitwood has consolidated with the Cooper & Peters lease adjoining, on which a good prospect has been developed.

Eldorado Mining Company—Adam Scott and associates have taken this prospect on the Gray land southwest of Joplin. Six drill holes, the shaft and 125 ft. of drifting all show good ore in soft ground.

North Pole—E. Becker, of Milwaukee, has purchased a 20-acre lease and the North Pole mine northwest of Carthage for the sum of $15,000. A 250-ton mill is to be erected.

Freeman—William West is erecting a 150-ton mill on this lease at Toms Station.

Little Mary—The company at Neck City has succeeded in closing the crevices in the cave under the north fork of Spring river and has now started pumping the water from the mine.

Montana

Broadwater County

De Lome—Articles will soon be filed by the De Lome Gold Mines Company, capital $100,000. The officers are: Thomas J. Casey, president; Joseph Jones, vice-president and treasurer; and Samuel P. Beall, secretary. The company has acquired the De Lome and Sunlight claims in the Radersburg district. A shaft has been sunk 40 ft. on the De Lome claim.

Butte District

Anaconda—At the Mountain View mine the first tests have been made in hoisting and lowering the empty skips by the use of compressed air in the main hoisting engine in the place of steam; hoisting through this shaft will soon be commenced again. The force at the Badger State mine has been increased; there are 200 men on the payroll and an average of 400 tons of ore per day is being hoisted.

Davis-Daly—Walter H. Wiley, who recently examined the Colorado mine of the Davis-Daly company, made a favorable report on the property. He recommended extensive development, and that the company confine its attention to the mining of the bodies of high-grade ore leaving the lower grade for the future. Development work on the rich orebody struck on the 1700-ft. level will be pushed as rapidly as possible as a result of his recommendation. The West crosscut on the 1400-ft. level will be continued 2000-ft. to the boundary line. The Davis-Daly veins are known to run, in faulted and broken form, in a northerly direction, in contrast to a majority of the Butte Hill leads, which in general strike east. Development work will be carried east toward the Moonlight mine of the Amalgamated company. The main lead of the property, which has been extensively developed from the 1000-ft. level to the 1700-ft. level, contains bodies of low-grade ore averaging 2.75 per cent. copper and 5 oz. silver per ton; this vein will not be mined at present.

Pilot-Butte—The Pilot-Butte Mining Company has been organized with a capital of 100,000 shares, of $10 par. Edward Hickey, the original discoverer of the Anaconda mine, is president. The Pilot claim adjoins W. A. Clark's Elm Orlu mine on the east, and lies north of the North Butte company's Berlin claim. The shaft is down 530 ft. and will be continued to the 1500-ft. level, and there is talk of driving a crosscut on either the 1200-ft. or 1400-ft. level of the Butte & Superior mine to connect with the Pilot shaft, as this would be a convenient method of exploration for both companies.

CHOUTEAU COUNTY

For the month of April, Chouteau county leads all others in the shipment of bullion according to the report of F. B. Miller, of the government assay office at Helena. The gold and silver bullion from the various counties is: Broadwater, $36; Chouteau, $45,799; Deer Lodge, $210; Fergus, $22,685; Lewis & Clark, $14,410; Madison, $39,563; Missoula, $7; Powell, $128; Silver Bow, $1676, making $124,517 the total for Montana.

FLATHEAD COUNTY

Flathead Mining and Development Company—This company has been incorporated by Louis H. Johnson, with a capital of $40,000. The company owns several claims, which will be developed and operated.

JEFFERSON COUNTY

Corbin Metals—The company now has ownership of 176 acres of ground; the shaft has been sunk to a depth of 500 ft., and about 800 ft. of development work has been done on the veins. A meeting of the directors will soon be called to discuss plans of a concentrator.

Eagles Nest—On May 4 the Montana State Mining Corporation was organized with a capitalization of 1,000,000 shares, par $5. The company owns the Eagles Nest group of claims, consisting of 38 claims 7½ miles northeast of the Corbin-Wickes district. On this property, 41 veins have been traced which will be developed by means of a tunnel driven over 7000 ft., intersecting the veins at depths ranging from 200 to 1100 feet.

Nevada

STOREY COUNTY

Mexican—From prospecting work in the vein, ore of the value of $75,242 was produced since April 1. Shipments are being made to the Selby and Mountain Copper smelteries.

Ophir—From the Hardy vein stope on the 2100 level, 331 mine cars of ore worth $10,053 was produced. The Kinkead mill has completed a 2000-ton run and concentrates and bullion have been shipped.

Consolidated Virginia—Considerable water is flowing into the mine, as a result of recent drifting, but not in sufficient quantity to delay work.

C. & C.—The wooden buildings around the shaft collar are to be removed and steel buildings erected. The headframe will stand in the open.

Ward Shaft—A south drift on the 2000 level, being driven toward Gold Hill, has reached a point where it is expected that old workings can be tapped by diamond-drill holes to draw water from the Crown Point, Belcher and Yellow Jacket below the 1800 level. The water is now just below the 1400 level and the new drainage will open 400 ft. of ground for prospecting.

WHITE PINE COUNTY

The item as to sale of the property of "Ely Consolidated" on p. 982 of the JOURNAL of May 13, 1911, referred to the Ely Consolidated Mining Company, not to the Ely Consolidated Copper Company. Of course, this should have been carefully specified in the first place, but the similarity of the names led not unnaturally to confusion.

Oklahoma

C. & L. Company—Milling machinery is being unloaded that will give the mill double the capacity of any other in the district.

United Mines Company—The mill has been successfully started and in the mine much ore has been blocked out.

Oregon

BAKER COUNTY

North American—This mine near Beaumont has been purchased by Emett Callahan at a recent sheriff's sale. Considerable development work is planned for the coming summer.

Climax—Active operations will be started on this property in the Cracker Creek district by the owner Col. G. W. Grayson, of San Francisco.

JOSEPHINE COUNTY

A large area of placer ground near Waldo has been purchased by a recently organized company, with Frank M. Leland, in charge. It is the intention to work on a large scale.

Oriole—Some high-grade ore has been uncovered on the 600-ft. level. Fayette Jones, Grant's Pass in charge.

Pennsylvania

Philadelphia & Reading Coal and Iron Company—The financial statement for the nine months of the fiscal year from July 1 to March 31 shows gross earnings of $24,466,194; expenses, $24,150,858; net earnings, $315,336. As compared with the previous year there was an increase of $643,391 in gross earnings, but a decrease of $499,847 in net earnings.

Utah

JUAB COUNTY

Tintic shipments for the week ended May 5 totaled 141 cars, including one car of concentrate from the May Day mill.

Beck Tunnel—A good body of lead-silver ore has been found, but in Uncle Sam ground. The work was done with the approval of the Uncle Sam, in order to give the Beck Tunnel a better idea of the ore system south of the large break. The strike promises good returns for both companies.

Mammoth—Drifting to the northeast is being done on the 500-ft. level for ore opened in a raise. Six cars of ore have been settled for from the recent strike on the 800-ft. level, with others in transit.

Victoria—The new hoist and compressor is in place. About two cars a week are being sent out.

Swansea—Operations are in progress in both the north and south workings on the 700-ft. level. About 150 gal. of water per minute is being pumped, and when the shaft is unwatered sinking under contract will be started.

Iron Blossom—About 100 tons of ore is being sent out daily from the No. 1 workings. This ore comes largely from the stopes above the 500 level. Drifting is being done on the 600, and the ore should be opened here within the next month or six weeks. Considerable development work is in progress.

Bradley—The shaft at this North Tintic property has passed the 450-ft. level.

East Crown Point—A new Cameron sinking pump will be installed.

Opohongo—An empty cage dropped April 29, which prevented the usual tonnage being sent out. Eight carloads of ore were marketed during the week.

King William—Work through the Eagle & Blue Bell mine has been temporarily suspended, pending a survey of the Grand Central workings, which has been granted by the company, in order to give the King William all the help possible in finding ore.

Sioux Consolidated—Cyanide tests on ore from this property as well as from the Grand Central and Gold Chain, which have been made on a small scale are reported to have been satisfactory. Other tests with larger lots will be made, to see if the same results can be obtained. If these experiments are successful, the erection of a cyanide plant will be considered.

Iron King—The main tunnel is in about 400 ft., and is being continued. Raising from the tunnel is under way; George Parker, superintendent.

Tintic Central—Small stringers of ore have been cut in drifting east on the

870-ft. level. Picked samples assay up to 31 per cent. lead.

Yankee Consolidated—This property was closed down for 10 days, beginning April 27, on account of the breaking of a casting. The shaft, when work was stopped, was at the 760-ft. point, and showed some quartz in the bottom.

Crown Point—The shaft is down to the 330-ft. point, all in limestone. It is expected to begin drifting shortly.

SALT LAKE COUNTY

Utah Consolidated—Between 80,000 and 100,000 tons of ore have been added to the reserve since last fall. A winze sunk from the tenth to the eleventh level has shown the ore to be of greater width than on the upper levels. The grade is about 2.4 per cent. copper. A new body has been opened on the tenth level. About 400 tons per day are being shipped to the International smeltery, which is reported to run between 3½ and 4 per cent. copper. Recent development has opened ore as high as 6 per cent. copper in places. Conditions at the property are said to be much improved.

Bingham Mines—Connections have been made between the old Commercial workings and the Niagara tunnel, giving an additional depth of 200 ft. on the dip of the orebody. Shipments will be resumed. Operations by way of the Niagara tunnel became necessary on account of the Utah Copper's securing Copper Center gulch last year, into which the Commercial tunnel opened, for dumping purposes.

Ohio Copper—The 60 No. 3 Deister slime tables recently ordered will take the place of the Wilfley tables now at the slime plant; the Wilfleys will be added to the main mill. Experiments carried on with the Deisters gave a recovery of 300 and 350 lb. of concentrate per table in 24 hours, carrying 34 per cent. copper.

New England Gold and Copper—The old Nast property is being worked through a tunnel at a depth of 200 to 250 ft. from the surface. Silver-lead ore of milling grade is being mined, with a small amount of shipping grade. The 50-ton mill is operated one shift, and about three cars of concentrate are marketed monthly.

Utah Copper—This company has rerecently acquired the Payroll group of claims comprising 175 acres lying south of the western portions of the original Utah Copper ground, and north of the Boston Consolidated territory. There are eight full claims, and two fractions. This gives the Utah Copper all the intervening ground between its original holdings and that acquired from the Boston Consolidated.

Utah Metal—It is expected that work will be started on the Bingham side of this company's large drainage and operating tunnel during the summer. The tunnel has been driven 4700 ft. from Middle cañon on the Tooele side and when completed will be 1100 ft. long.

Rexall Silver and Copper—The stock of this company, owning property in the Big and Little Cottonwood districts, was listed on the Salt Lake exchange, April 26. The application for listing states that the company is organized for 500,000 shares, par value 25c., of which 80,831 shares are in the treasury, and has $1088 cash.

Utah Mines Coalition—Shipping ore has been followed on the vein for 200 ft. Since resuming operations after the snowslide, 65 ft. of work have been done in ore. Ore-bins are being built at the mouth of the tunnel, and what ore has been extracted recently from development is being stored underground. Shipments will be started as soon as the roads are opened.

Virginia

Explorations carried on by Walter Graham at Falls Gap, in Giles county, have developed a deposit of iron ore of good quality. It is near both the Norfolk & Western and the Virginian railroads. The outcrop is 700 ft. above and 3200 ft. from the Norfolk & Western tracks.

Washington

FERRRY COUNTY

Advance—Operations on this property which has been idle for several months, have been resumed. O. F. Parmeter, Covada, in charge.

Factor—A new gasolene hoisting plant and other machinery is to be installed. J. R. Brown, Orient, president.

Republic Mother Lode Mining and Milling—This company has been incorporated with offices at Republic, and will start development work.

Gem—The company has decided to install a gasolene-driven ventilating plant. H. W. Working, Orient, manager.

McKinley—The owners of this property are considering the installation of a cyanide plant. C. F. Wikstrom, Orient, in charge.

Arkansas Group—This company is to bond its seven claims at Kettle Falls.

Little Giant—Henry Lancaster, of Spokane, and associates, have taken an option on this property.

Knob Hill—The company is making shipment of 25 tons of ore every day, and expects to double the output with the installation of drills. Joseph McFarland, Republic, is superintendent.

San Poll Consolidated—Preparations are being made for installing new machinery on this property. Robert A. Koontz, Spokane, is president.

North Star—An engine, compressor and drills are being installed in this mine under the direction of S. A. Eslick, Orient.

Morning Glory—This property, which has been idle for several years, is now being worked by the Gold Coin Mining Company; J. L. Bailor, Republic, president. Some new machinery will be installed.

Last Chance—Some extensive improvements are being planned by the Federal Mining Company, of Spokane. A modern sorting plant will be installed.

West Virginia

FAYETTE COUNTY

Federal Coal Company—This company,, of Fairmont, W. Va., has been granted a charter with a capital of $100,000, and will operate in Logan county. C. E. Hutchinson and associates are the incorporators.

Christian Coal Company—This new company, headed by Judge Christian, of Lynchburg, recently purchased 2000 acres on Paint creek. Quinn Morton will have charge.

Morris Fork Coal Company—Eight hundred acres of coal land, at Heatherman, will be developed for a daily output of 400 tons.

MCDOWELL COUNTY

United States Coal and Coke Company—Fires have been lighted in 1500 coke ovens in the Gary field. Employment will be given to several hundred men, and it is planned to increase the coal output to 10,000 tons daily before June 1.

New River & Pocahontas Consolidated Coal Company—The output will be increased by 1,500,000 tons by the end of the year. This increase will come from the company's mines at Minden, Gentry and Berwind.

Shannon Coal and Coke Company—This company, at Dawson, will soon commence work on the building of 20 new ovens. The old bases can be used, and this will mean a great saving in the cost of erection.

Dixon-Pocahontas Fuel Company—A shaft will be sunk to No. 3 Pocahontas vein, at Olmstead.

J. B. B. Coal Company—This is one of the largest coal companies chartered for some time. Principal office is at Twin Branch; operations will be located in Brown district to develop coal, iron, manganese and timber properties. The authorized capital is $500,000, and the incorporators are H. M. Jewett, of Detroit, Mich., and A. Balantine, of Boston.

MINERAL COUNTY

At Gleason, P. H. Brown, of Cumberland, Md., and others, have acquired the Gleason Coal and Coke Company, and expect to increase the output of the mines from 300 to 1000 tons daily.

Canada

ONTARIO—COBALT

The shipments from Cobalt for the week ended May 5, were: La Rose, 210,790; Crown Reserve, 148,830; Trethewey, 139,500; Cobalt Lake, 124,340; Coniagas, 116,120; Temiskaming, 83,130; O'Brien, 78,000; Nipissing, 74,900; McKinley-Darragh, 70,310; City of Cobalt, 65,500; Hudson Bay, 62,170; Buffalo, 57,520; total 1,231,110 pounds.

Bullion shipments were: Crown Reserve, 22,128 oz.; Nova Scotia, 35,000 oz.; total, 57,128 ounces.

Silver Leaf—The 420-ft. main shaft will be sunk until it enters the Keewatin. The work is being done by the adjoining Crown Reserve.

Right of Way—This Cobalt company has purchased the Weston claims in Porcupine, and has started work on them. There is a good surface showing.

La Rose—The main shaft is being sunk to 270 ft., the deepest working level.

Crown Reserve—A contract has been signed to treat 100 tons of low-grade ore per day, extraction guaranteed, in the Nova Scotia mill. An aërial tram, 5000 ft. long, will be built between mine and mill.

Green-Meehan—A stope has been made for 120 ft. the whole length of the opencut, the value of ore blocked out being estimated at $100,000. The west vein has been drifted on for 150 ft., the north face of the drift showing 4 in. of calcite carrying argentite.

ONTARIO—PORCUPINE

Work on the Sandy Falls power plant, at Porcupine, has received a severe setback, owing to the sawmill and all the lumber being destroyed by fire.

Hughes—It is stated that Montreal capitalists have secured an option on these properties, in Whitney township. The price is $250,000, with 10 per cent. interest.

Gillies Lake—This property, under the lake, is being prospected with a churn drill, operated from a platform in the lake. The vein carries gold.

Dome Extension—A shot drill will be operated to test the vein at 300 ft. Sinking is being done.

Jupiter—Another high-grade vein has been found.

Rea—The main vein has been cut with the core drill at 240 ft. The shaft is down 210 ft.; at 250 ft. a station will be cut, and crosscuts run to the vein.

Ontario-Porcupine Goldfields Development Company—Accommodation for 75 men has been provided on the three Timmins claims east of Pearl lake, to be known as Camp No. 4. A compressor, with power for six drills and two steam hoists, have been put in place. Trenching and stripping are in progress and sinking has been started. Manager Williams states that it is proposed to sink by hand instead of using the compressor plants, as he considers the hand method easier and cheaper until a good depth is reached. At Camp No. 2, in North Tisdale, work is proceeding on the Dunlop claims. Trenching and stripping are being done to discover quartz deposits that may give indications of orebodies with depth.

Royal Porcupine—Operations will be started south of the Vipond, where three strong veins have been encountered. Julius Messer is in charge.

Imperial—The main shaft is down 80 ft. Crosscutting will be started at the 100-ft. level to three veins, which show on the surface.

Babyan—This claim, in the bed of Gillies lake, bordering on the Hollinger, has been tested by diamond drilling, showing that a vein of quartz 10 ft. wide, carrying free gold down to 28 ft., runs through the lake. It is supposed to be an offshoot from the Hollinger vein. A cement shaft will be put down to the lake bottom.

YUKON TERRITORY

The Klondike cleanup has begun; water is running everywhere; dredges have started; the hydraulic plants are getting into action, and individual miners are washing out winter dumps.

Yukon Gold—According to recent reports, several dredges of the Yukon Gold Company started operating on May 1. This is the earliest date of placing boats in commission in the experience of the company. The last dredge went in commission May 24 last year.

Mexico

CHIHUAHUA

With an armistice between the contending field forces in this state during the last 10 days of April and the probability of an early peace settlement, mining conditions show considerable improvement, as might be expected. During the last week of April Chihuahua city was again *incommunicado* as regards the United States and points south of Torreon, and this is serious for the local smeltery gets all its coal and coke from the Coahuila fields to the south. However, at this writing the smeltery has ample coal and coke for about three weeks and has sufficient ore on hand and is receiving enough from Santa Eulalia regularly to insure continuous operations. Although disturbances have increased in the eastern part of the state, the Orient railway is running as far as Trancas, from which point limestone is secured. The smeltery was still operating five furnaces on May 1.

Regular train service has been maintained on the Mexico-Northwestern line west since its resumption on April 21, so that the mines in the Sierras are operating under more favorable conditions and some ore is being brought in to the Chihuahua smeltery, and even bullion is coming in. There are, of course, marauding bands of bandits in the more remote sections, but thus far they have been unable to commit many depredations on account of the vigilance of the Maderistas who will not countenance robberies and hold-ups.

Everything is quiet in the Santa Eulalia camp in spite of the complete dearth of Federal officials of any kind and the frequent visitation of *insurrectos*. A normal tonnage was sent out in April, the American Smelting and Refining Company alone shipping about 5000 tons to the local smeltery.

No production is being made from points along the Orient railway east of here nor along the line between here and El Paso, but with the resumption of railroad traffic a large tonnage of accumulated ore will be immediately moved. The majority of the mines have been operating and are simply piling up ore.

While the Parral and Santa Barbara camps were somewhat upset by disturbances actual and feared during the latter days of April the work in the main has continued uninterruptedly and a normal output was made. The Veta Colorado and Alvarado mills have operated regularly and marketed bullion weekly. Some of the ore and concentrate-shipping mines have suffered on account of being unable to make shipments to smelteries south but with regular service increased shipments will follow so that there may not be much falling off in output. The railroad line is not in operation west of Santa Barbara so that the camps tributary to Rosario in the state of Durango, notably Guanacevi and Indé, are handicapped.

The industry appears to be progressing as usual in the Guadalupe y Calvo section, two mills being in commission and a third one under construction. Definite announcement is also made of the plans of F. Stallforth, of Parral, for the immediate erection of a 50-ton cyanide plant at the Los Angeles mine in this camp.

Africa

MADAGASCAR

The official reports give the exports of gold from Madagascar in 1910 at 104,002 oz., or $2,149,721. This is a decrease of 14,884 oz., as compared with the preceding year.

TRANSVAAL

Gold production in the Transvaal in April is reported at 667,714 oz., or 8351 oz. less than in March. The loss was entirely due to the shorter month, the average daily output having increased from 21,809 oz. in March to 22,257 oz. in April. For the four months ended April 30 the total production was 2,490,154 oz. in 1910, and 2,605,634 oz.—or $53,858,455—in 1911; an increase this year of 115,480 oz., or 4.6 per cent.

The Markets

Coal Trade Review

New York, May 17—The coal-trade situation in the West continues practically unchanged. In most districts short time at mines is the rule, and the lower production seems to meet all demands without difficulty. The slow opening of the Lake trade is a disappointment to many operators. It looks as if heavy shipments to the Northwest can hardly be expected before June.

The seaboard bituminous trade is still slow, and few signs of increased life are apparent. Coastwise business is small for the season. The anthracite trade is slightly less active than it was, but is still good.

Rates on Bunker Coal—Some time ago the Interstate Commerce Commission granted the Carolina, Clinchfield & Ohio Railroad permission—by virtue of the power given the Commission under the long- and short-haul clause of the act—to maintain lower rates on coal from Virginia mines to Charleston, S. C., for export than were exacted on coal for domestic use. The permission then granted also extended to coal for transshipment or to be loaded in bunkers. Recently a decision in the so called restricted-rate case was handed down by the Commission, by the terms of which roads were not allowed to grant one another low rates on coal for consumption by carriers themselves. This has required a change in the earlier permission, so far as relates to bunker coal, as that is now considered inconsistent with the new ruling. The lower rates on bunker coal are, therefore, ordered to be discontinued. It is understood that this revocation will be made general.

Coal Traffic Notes

Coal and coke tonnage of the Chesapeake & Ohio railway, nine months of fiscal year from July 1 to March 31, short tons:

	Coal	Coke	Total
Tidewater	3,169,506	15,588	3,185,094
Points east of mines	1,493,272	156,006	1,649,278
Points west	6,996,671	65,024	7,061,695
Total	11,659,449	236,618	11,896,067
Total, 1909-10	11,262,361	320,407	11,582,768

Total increase, 313,299 tons, or 2.7 per cent. Tidewater tonnage this year was 27 per cent. of the total; other eastbound, 13; west-bound, 60 per cent.

New York

Anthracite

May 16—Business in domestic sizes has quieted down, but is still fairly active. The steam sizes are moving well, with the usual call for deliveries on contracts.

Schedule prices for May on domestic sizes are $4.35 for lump, $4.60 for egg and stove and $4.85 for chestnut, all f.o.b. New York harbor. On steam sizes quotations are: Pea, $3@3.25; buckwheat, $2.30@2.75; No. 2 buckwheat or rice, $1.80@2.25; barley, $1.45@1.70; all according to quality, f.o.b. New York harbor.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Bituminous

Coastwise trade continues slow. Contract making drags along, and apparently will continue to do so. Harbor trade is irregular, buying being spasmodic and varying from day to day. West Virginia coals are not being pressed for sale as hard as they were last spring, and the curtailment of tidewater shipments is quite apparent in its results. In fact there is less free coal from all quarters on the market than there has been for some time.

Prices are about the same. A fair steam coal can be had at $2.50@2.60, f.o.b. New York harbor. Lower grades sell down to $2.30, and better up to $2.85, with a few specials at $3. Gas coals are a trifle firmer at $1.10 for ¾-in. at mines, $1 for run-of-mine and 75@85c. for slack.

Coastwise trade improves a little and there are not so many spare vessels. Rates are a little firmer. Large boats get 70@80c. from Philadelphia to Boston or Portland. From New York rates are 55@65c. to Boston or Portland; 40c. to Providence and New Bedford; 25@30c. to Sound ports. From Hampton Roads to Boston, 75@80c. is asked.

Birmingham

May 15—The coal trade is still quiet. It was believed that the summer would see a steady condition in the coal business, but the bottom dropped out almost overnight and the production is being curtailed more and more every week.

Plans for extensive development in the Alabama coalfields are well in hand. The Pratt Consolidated Coal Company, which has been buying up coal lands in Jefferson and Walker counties for some time, will, it is understood, take up the development as soon as some railroad extensions are completed.

Chicago

May 15—The coal market is remarkably good, for a May market. Sales of steam coal are not large but steady, while the domestic market surprises many dealers by its strength. With an abundance of supplies from the western mines there is no distinguishable crowding to the point of forcing very low prices, on lump, and on screenings they are slightly higher than a week age. Contract sales are heavy, though not at high prices. Eastern coals are quiet but shipments are well regulated and prices are firm.

Illinois and Indiana coals bring for lump, $1.85@2.25; run-of-mine, $1.65@1.75, and screenings $1.70@2. Smokeless sells well up to the circular prices of $3.55 for lump and $3.15 for run-of-mine. Hocking is very strong at $3.15. Anthracite sales are light but increasing.

Cleveland

May 15—Lake rates on coal for the season have been fixed at 30c. from Lake Erie ports to the head of Lake Superior and 35c. to Lake Michigan ports. The trade is still very quiet and vessels are slow getting out.

Local trade is rather dull. Nothing doing in domestic, and steam coal demand is growing very slowly, if it does grow at all. Prices are unchanged, except that slack is a little higher, being in short supply.

Indianapolis

May 15—The coal trade locally shows very little change. Few mines are working anything like full time. The only mines that are running full are those having special contracts. Steam-coal consumption is improving, but not much. The railroads are not taking quite as much coal as usual, and very few consumers seem to be storing coal just now.

Pittsburg

May 16—Local demand for coal continues light, while Lake shipments are not increased, the congestion between mine and Lake vessel continuing on account of the lightness of the movement. Prices are indifferently well maintained, and we continue to quote: Nut, $1.05@1.15; mine-run, $1.10@1.15; ¾-in., $1.20@1.25; 1¼-in., $1.30@1.35; slack, 75c. per ton at mine.

Connellsville Coke—The strike in British Columbia has been felt in the Connellsville coke trade, a sale of 5000 tons of smelter coke having just been made, at $1.50 at ovens. The coke will be shipped to Ashtabula and taken across the lakes in two cargoes to Fort William at a 50c. rate, to be delivered to the Ca-

nadian Pacific, which controls the British Columbia smelters where the coke will be used. A sale of 1000 tons of prompt furnace coke has been made to an eastern concern, at $1.65, which is above the market for ordinary furnace grades. We quote: Prompt furnace, $1.50@1.55; contracts for second half, $1.75@1.85; prompt foundry, $1.90@2; contract, $2@2.25, at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended May 6 at 280,367 tons, a decrease of 20,000 tons, and shipments at 3076 cars to Pittsburg, 5136 cars to points west and 798 cars to points east, a total of 9010 cars, a decrease of 200 cars. Production is now down to the rate in the first fortnight of January, there having been an increase to a weekly rate of 370,000 tons in the closing fortnight of March.

St. Louis

May 15—The market remains very dull, and no change can be expected as long as the situation at the industrial plants remains as unsatisfactory as it is at present. Of course, there is a fair amount of business done by dealers, but it is so far below the normal level that it leaves a surplus of coal to depress the market. Standard coal still makes up the bulk of the receipts, and Carterville is less in evidence. The best demand continues to be screenings, and they command a better price relatively than mine-run or lump. Next to screenings nut is most called for.

Standard operators seem determined to keep on operating their mines, though—as has been said before—most of them who are running now are losing at least 5c. per ton on their entire output.

Anthracite—The shipments ordered in April are arriving more freely. Anthracite is moving fairly well, and business looks better than in soft coal.

FOREIGN·COAL·TRADE

German Coal Production—Coal production of German Empire, three months ended March 31, metric tons:

	1910	1911	Changes
Coal	36,370,787	40,206,274	I. 3,835,487
Brown coal	16,147,498	18,571,886	I. 2,424,388
Total mined	52,518,285	58,778,160	I. 6,259,875
Coke made	5,636,781	6,364,091	I. 727,310
Briquets made	4,469,226	5,311,385	I. 842,159

Of the briquets reported this year 4,096,946 tons were made from brown coal or lignite.

German Foreign Trade—Exports and imports of fuel in Germany, three months ended March 31, metric tons:

	Exports	Imports	Excess
Coal	6,367,819	2,088,386	Exp. 4,279,433
Brown coal	15,438	1,772,985	Imp. 1,757,547
Coke	1,149,790	142,402	Exp. 1,007,388
Briquets	560,529	59,251	Exp. 501,278
Total	8,093,576	4,063,024	Exp. 4,030,552
Total, 1910	6,560,172	3,952,955	Exp. 2,607,217

Exports this year include 4090 tons of coke to the United States.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal on May 5, as follows: Best Welsh steam coal, $4.17; seconds, $3.93; thirds, $3.81; dry coals, $3.84; best Monmouthshire, $3.72; seconds, $3.54; best small steam coal, $2.58; seconds, $2.28. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, May 17—The iron and steel trades must be reported as still in a waiting position. One cause—perhaps the chief cause—is the persistent rumor that prices of steel will soon be reduced. This seems to be generally believed, though the leading interest insists that no changes are needed or intended. Such statements have been made before, however, and have been followed by changes.

A cut of $2 per ton in steel bars, to 1.40c., Pittsburg base, was expected, but is now said to be postponed. This is quite plainly the result of the action of the large agricultural-machinery makers, who have held back from making their yearly contracts, which are usually closed before this time. It is believed to be the result of a general agreement of the larger independents. Whether it will be followed by other reductions is yet to be seen; but there is a strong feeling that a general readjustment of prices is soon to come. Meanwhile the smaller independents are known to be shading prices on sheets and wire products, and the low prices made by Eastern fabricating companies have already been noted.

New business for the week has been confined largely to structural steel. Building is active, and there are many small orders coming forward, outside of the large pending contracts for city-railroad and municipal work. A number of small contracts for rails and equipment have been placed by different railroad companies. The rail orders make up a total of about 75,000 tons for the week.

Pig-iron business in Eastern territory has been confined chiefly to small orders for foundry iron. Southern iron is still pushed, but with few sales. In the Central West there has been some business in foundry and basic pig. There is a general disposition among buyers to insist on small cuts in prices, and this is holding up some business.

Lake Superior Iron Ore—Shipments of iron ore from the upper Lake ports to May 1 were, in long tons:

	1910	1911	Changes
Escanaba	223,025	93,532	D. 129,493
Marquette	135,559	14,838	D. 120,721
Ashland	218,703	41,337	D. 177,366
Two Harbors	278,284	54,157	D. 224,127
Superior	355,307	76,739	D. 278,568
Duluth	309,427	51,042	D. 258,385
Total	1,520,305	331,645	D. 1,188,660

Last year April shipments made a record; but this year they were light. The May shipments, in all probability, will be small also.

Baltimore

May 15—Exports for the week included 540,940 lb. spelter and 243,000 lb. steel billets to Liverpool. Imports included 3250 tons ferromanganese and 30 tons silicospiegel from Middlesboro, England; 5496 tons pyrites from Huelva, Spain; 5250 tons iron ore from Cuba.

Birmingham

May 15—There is no denying the dullness of the pig-iron market in the Southern territory. There is a little iron being shipped out of the territory and the melt is fairly good in the home market, but there is so much room for improvement that no claim to activity can be made. Reports are current that cast-iron pipemakers are in the market for a good quantity of pig iron. The quotation is still $11 per ton, No. 2 foundry, though reports are that $10.60 and $10.80 have not been refused in some parts of the Southern territory.

The Tennessee company will resume operations at its steel plant at Ensley, in June. Some orders for rails have been coming in recently, among them being one for 14,000 tons from the Louisville & Nashville Railroad Company. The Southern Iron and Steel Company has just completed the delivery of 20 carloads of steel nails. It is understood that in the warehouse of this company there is something like 90,000 kegs of nails stacked up now.

Chicago

May 15—Sales of pig iron continue light, with hardly any prospect of their increasing until production has been substantially lessened. This indicates general caution on the part of melters, who occasionally test the market by an inquiry for quotations on a good-sized lot. It is claimed by sales agents that the price of $11 Birmingham—$15.35 Chicago—is being maintained for No. 2 Southern, but some sales may have been made below this figure; on Northern No. 2 the price is nominally held at $15 but this, too, is subject to some discounting. A very dull season appears to be in prospect for the next month at least. Melters generally are running with small forces, with general business conditions not encouraging.

In the finished-products market everything is very quiet. Contracts for railroad supplies and structural material, the leading branches, are light. The coke market is dull with Connellsville at $4.75, Chicago.

Cleveland

May 15—The ore market has been quiet. There is some talk of sales to eastern furnaces, but none have been closed, so far as known. The movement is still light and many boats have not started yet.

With 7,650,000 tons on Lake docks on May 1 there is no hurry for new supplies. The April shipments were only 331,645 tons, a decrease of 78.2 per cent. from last year.

Pig Iron—A contract for basic was placed last week at $13.25 at furnace. Other sales have been limited to small lots for short delivery. Current prices, Cleveland delivery are $15.90 for bessemer, $13.75@14 for basic, $14.25@14.50 for No. 2 foundry, $13.25@13.50 for gray forge.

Finished Material—Some good local contracts for structural steel are under discussion. Orders are coming in for other material, but they are generally small. Jobbers report some improvement in business from stores.

Philadelphia

May 17—Some activity in basic iron has developed within a few days, resulting in considerable sales of iron, which will be further augmented in all probability before the close of the week. Buyers are inclined to take advantage of the present weakness started in the West and it is stated today that large transactions can be certainly accounted for. In forge and foundry irons scarcely any movement is observable beyond the small hand-to-mouth sales which have no significance. Southern irons have been again offered at a shading which has interfered with some expected sales in this territory. Stocks are larger at furnace banks than usual and the anxiety to reduce them may lead to some shadings similar to the course of the basic pig market. Southern iron is a thorn in the side of not a few producers and unless something favorable transpires makers will feel obliged to take some action to arrest any further accumulation. Furnaces are selling No. 2 foundry at $15,75, but cannot induce buyers to purchase beyond present needs.

Steel Billets—Further deliveries of steel billets are being made on old contracts, but it is impossible to trace up sales during the past week.

Bars—While quotations are the same, orders in a few cases were accepted within a week for a slightly lower figure than has been named for months.

Sheets—Corrugated material seems to be holding up better than any other line. Construction requirements are shaping up nicely.

Pipes and Tubes—Manufacturers have made a pretty thorough canvass of eastern territory without so far as is known up until today securing much business.

Plates—The plate mills are beginning to gather in an encouraging amount of business.

Structural Material—A good week's business has been done in structural material in which the requirements for general construction work have figured up well. Bridge building material has been liberally ordered. Structural manufacturers have knowledge of a large amount of work that will reach them for figuring early in June.

Scrap—The moderate improvements in certain lines served to bring out a few buyers who have been asking prices for a month past. The inquiries at present are for wrought scrap, steel melting scrap and railroad scrap. The prices are favorable and the larger dealers are counting upon reducing their stocks within a few days.

Pittsburg

May 16—The local trade is pleased that the Supreme Court decision in the Standard Oil case has been rendered. The decision itself caused no surprise, as one adverse to the trust has been expected. The decision is regarded as moderate and few prosecutions of other trusts or combinations is expected, emphasis being laid on the words "undue" and "unduly" in the decision. As for the United States Steel Corporation, the opinion seems to be fairly general that while the Government might be able to get a decision against it, the preferred course will be to work for Federal incorporation and regulation, thus putting in practice what the Government has gained, rather than risking the possibility of an adverse decision and the complete loss of any power to control.

It is held that orders for steel products have been kept back by many buyers because they feared wholesale prosecutions after the Standard Oil decision, but that as the decision was rendered buyers will not be afaid of such disturbances and will now be disposed to buy more freely. In some quarters, however, the opinion is freely expressed that there is no ground for expecting any improvement in business, and that materially better business is not to be expected until 1913. The more common view is that business will soon begin to pick up and will begin to assume important proportions by July, making the second half of this year a much more satisfactory one than the first half is proving.

The volume of business in pig iron and finished steel products has not been materially different in the past week from the two preceding weeks. There are minor ups and downs with the different producers, but no general change. Buying is perhaps 30 per cent. of full capacity, while production, being based partly upon old business, is hardly down below 50 per cent. Comment is made upon the large number of small orders being booked. Prices of steel products continue to be firmly held by the leading producers, shading being confined to a few small interests and not being very extensive in amount at that.

The Steel Corporation on April 29 had 550,000 tons more business on its books than on Dec. 31. Taking the corporation's capacity at 1,200,000 tons a month, the April loss in orders amounted to 20 per cent. of capacity, indicating that bookings were 20 per cent. less than shipments, the latter probably being between 55 and 60 per cent. of capacity and the former between 35 and 40 per cent. In the past three weeks bookings have been slightly less than the April average.

Pig Iron—It is understood the American Steel Foundries got the 5000 tons of basic it was inquiring for at a shade under $13.25, Valley furnace, a new low price on this movement, but not as low as sales were made at last October, when $13, Valley, was touched. The basic market is quotable 25c. lower than last week and 50c. lower than three weeks ago. Foundry iron has been very dull. Bessemer iron has sold in a small way at slight concessions from $15, Valley, the regular quotation since last August, but it is claimed no large lot could be had at under this figure. A large interest has been canvassing the market with firm offers of spot cash for 10,000 tons, and it is reported that as high as $14.50 was bid on these terms without drawing out any iron. We quote, f.o.b. Valley furnaces, 90c. higher delivered Pittsburg: Bessemer, $15; basic, $13.25@13.50; No. 2 foundry and malleable, $13.75@14 per ton.

Ferromanganese—The market continues extremely quiet. A sale of about 300 tons is reported at about $36.50, Baltimore, at which we quote the market for both prompt and future, freight to Pittsburg being $1.95 per ton.

Steel—A sale of 500 tons of open-hearth billets is reported at $23, Pittsburg, the regular quotation, and made by one of the large steel interests. It is not denied, however, that one or two small open-hearth mills would make concessions of 50c. or $1 a ton on both billets and sheet bars. We quote regular prices at $23 for billets and $24 for sheet bars, f.o.b. maker's mill, Pittsburg or Youngstown, with wire rods at $29, Pittsburg.

Sheets—Demand continues light and mills are running at only about 50 per cent. of capacity. Regular prices are maintained except in a few instances: Black, 28 gage, 2.20c.; galvanized, 3.20c.; blue annealed, 10 gage, 1.65c.; painted corrugated, $1.55; galvanized, $2.75 per square.

St. Louis

May 15—The pig-iron market is still dull and foundries are buying only on a small scale. Occasionally a large inquiry comes in, but apparently to test the market only. Quotations remain $11 Birmingham—$14.75 St. Louis—for No. 2 foundry, but some shading is reported.

FOREIGN IRON TRADE

British Foreign Trade—Exports and imports of iron and steel and of machinery in Great Britain, three months ended March 31, are valued by the Board of Trade returns as follows:

	Exports	Imports	Excess
Iron and steel	£11,048,392	£2,796,782	Ex. £ 8,251,610
Machinery...	7,479,885	1,462,539	Ex. 6,017,346
Cutlery and hardware..	1,840,852	1,250,506	Ex. 590,346
New ships....	1,119,604	.....	Ex. 1,119,604
Total..... ..	£21,488,733	£ 5,509,827	Ex. £15,978,906
Total, 1910..	20,218,788	4,120,324	Ex. 16,098,164

Increase in exports, £1,269,945, or 6.3 per cent.; increase in imports, £1,389,203, or 33.7 per cent. The total quantities of iron and steel included above were, in long tons:

	1910	1911	Changes
Exports	1,095,786	1,095,567	D. 215
Imports	323,926	445,951	I. 122,021

The larger part of the imports is in billets, blooms, sheet bars and other half-finished forms.

Iron Ore Movement—Imports of iron ore into Great Britain, three months ended March 31, were: 1,797,292 long tons in 1910, and 1,889,637 in 1911; increase, 92,345 tons. Imports of manganese ore, 154,459 tons in 1910, and 101,060 in 1911; decrease, 53,399 tons.

METAL MARKETS

New York, May 17—The metal markets do not show much interest and few changes are to be noted.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold:			
Mar. 1911..	$ 505,615	$ 4,119,063	Imp.$ 3,613,448
" 1910..	1,815,815	4,873,885	Imp. 2,558,070
Year 1911..	1,854,024	19,465,737	Imp. 17,611,713
" 1910..	10,916,081	9,568,358	Exp. 1,347,723
Silver:			
Mar. 1911..	5,896,795	3,197,409	Exp. 2,699,386
" 1910..	4,552,624	3,994,456	" 558,168
Year 1911..	16,001,042	10,746,781	" 5,254,261
" 1910..	13,639,547	11,398,139	" 2,241,408

Exports from the port of New York, week ended May 13: Gold, $1100; silver, $915,375, chiefly to London. Imports: Gold, $98,791; silver, $478,132, from Mexico, South America, Japan and Australia.

Gold—The price of gold on the open market in London continued at the usual level, 77s. 9d. per oz. for bars and 76s. 4½d. per oz. for American coin. Supplies arriving were taken chiefly by the Bank of England.

Iridium—Prices are firm and unchanged, $62 per oz. being asked for pure metal.

Platinum—The market is firm, and supplies are not overabundant. The firmness abroad has been felt here, and prices have again advanced slightly. Dealers now ask $43 per oz. for refined platinum and $45.50 per oz. for hard metal, 10 per cent. iridium.

Silver—The market has been very steady. The large stocks in Bombay have not necessitated buying by the bazaars in the London market to any great extent. Consequently no rise has taken place on account of their action.

SILVER AND STERLING EXCHANGE

May	11	12	13	15	16	17
New York....	53⅜	53⅛	53½	53⅛	53½	53¼
London...	24⅝	24⅛	24⅛	24⅛	24⅛	24 1/16
Sterling Ex..	4.8640	4.8635	4.8635	4.8630	4.8620	4.8620

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to May 4, as reported by Messrs. Pixley & Abell:

	1910	1911	Changes
India.....	£2,282,600	£3,292,300	I. £1,009,700
China.....	1,113,500	802,800	D. 310,700
Total.....	£3,396,100	£4,095,100	D. £699,000

India Council bills in London brought an average of 16.08d. per rupee for the week.

Gold and silver movement in Great Britain three months ended March 31:

	Imports	Exports	Excess
Gold.....	£11,790 912	£ 8,147,947	Imp.£3,642,965
Gold, 1910...	11,249,963	12,154,359	Exp. 904,396
Silver.....	3,937,568	5,104,930	Exp. 1,167,362
Silver, 1910..	3,580,131	3,831,020	Exp. 250,886

Of the silver imported this year a total of £3,449,987 is credited to the United States.

Copper, Tin, Lead and Zinc

NEW YORK

May	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
11	12 @12¼	11.85 @11.95	42¾	4.35 4.37½	4.20 @4.22½	5.32½ @5.37½	5.17½ @5.22½
12	12 @12⅛	11.80 @11.90	42⅝	4.35 4.37½	4.20 @4.22½	5.32½ @5.37½	5.17½ @5.22½
13	1.. @12⅛	11.80 @11.90	42½	4.35 4.37½	4.20 @4.22½	5 32½ @5.37½	5.17½ @5.22½
15	12 @12⅛	11.80 @11.90	42¾	4.35 4.37½	4.20 @4.22½	5 30 @5.35	5.15 @5.20
16	12 @12⅛	11.85 @11.90	42⅞	4.35 4.37½	4.20 @4.22½	5 30 @5.35	5.15 @5.20
17	12 @12⅛	11.85 @11.95	43	4.35 4.37½	4.20 @4.22½	5.30 @5.35	5.15 @5.20

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Until the close of our week, when the decision of the Supreme Court appeared and sentiment generally was favorably affected, the copper market

LONDON

May	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
11	53 1/16	54 1/16	57½	195¾	189¾	13	24⅜
12	53 1/16	54⅛	57½	196½	189	13	24⅜
13	.....	.....	.....	.....	.....	.....	.....
15	53 1/16	54 1/16	57½	195¾	188¾	13	24⅜
16	53¾	54⅜	57½	197½	190½	13 1/16	24½
17	53 1/16	54 1/16	57½	197½	189¼	13 1/16	24⅜

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.04c. ± £1 = ± 0.21¾c.

dragged along in a dull fashion. Consumers both in Europe and in this country had for some time past been waiting to buy copper at 12c., delivered at their works, usual terms, and it was hoped that when this price was reached a large volume of business would result. As a matter of fact, during the week under review, some of the larger sellers offered at that price, and considerably more business was transacted than for some time past, the sales both for domestic and foreign delivery amounting in the aggregate to a very respectable total; but buyers generally remained rather timid, and the market did not show a better tone until Wednesday, May 17, when the improved feeling above referred to made itself felt. The market closes with Lake copper at 12@12⅛c., and electrolytic copper in cakes, wirebars and ingots at 11.85@11.95c. Casting copper is quoted nominally at 11⅝@11¾c. as the average for the week.

Copper sheets are 18@19c. base, for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 13¾c. base, carload lots at mill. Business is very quiet.

On May 11, 12 and 15, the London standard market was very quiet, and on the latter day standard spot was quoted at £53 8s. 9d. and three months at £54 1s. 3d. On May 16 and 17, there was considerable bull speculation, and the market advanced, closing at £54 1s. 3d. for spot, and £54 13s. 9d. for three months.

Copper exports from New York for the week were 5825 long tons. Our special correspondent reports the exports from Baltimore for the week at 1710 tons.

Tin—The notable feature of the London market was the persistent buying of spot tin on the part of the syndicate. This seems to indicate a forthcoming squeeze of the shorts. The result is a considerable advance in spot tin and only a moderate rise in futures, so that the back-

wardation for the latter, against spot, now amounts to about £8. Business in this market has not been very brisk, tin still being offered at about ½c. per pound below the import point. The close abroad is cabled at £197 10s. for spot, and £189 5s. for three months, while 43c. is the price quoted here.

Messrs. Robertson & Bense report that receipts of tin ore and concentrates at Hamburg, Germany, in April were 1179 tons, of which 1139 tons were from Bolivia and 40 tons from South Africa.

Lead—The market is quiet. There is some inquiry from day to day, which has been met at slightly lower prices. At the close, St. Louis is quoted at 4.20@4.22½c., and New York at 4.35@4.37½ cents.

The London market for lead is firm, good Spanish lead being quoted at £13 1s. 3d., and English at £13 3s. 9d. per ton.

Spelter—The market has been dull, and prices have gone off somewhat, St. Louis being quoted at 5.15@5.20c., and New York at 5.30@5.35c. In view of the continued strength in Europe it is hard to see how our market can go much lower, and in fact several sellers are holding aloof for the moment for that reason.

The London market is firm at £24 7s. 6d. for good ordinaries, and at £24 12s. 6d. for specials.

Base price of zinc sheets $7.25 per 100 lb., f.o.b. La Salle-Peru, Ind., less 8 per cent. discount.

Other Metals

Aluminum—The market continues dull, with prices unchanged at 20½@21c. per lb. for No. 1 ingots.

Antimony—The market is quiet, with only a retail business doing and prices unchanged. Cookson's is held at 9.40@9.60c. per lb. and U. S. at 9c.; while quotations are 8@8.12½c. for Chinese and Hungarian.

Quicksilver—Supplies here are a little better, but still scarce. Quotations show no change. At New York, sales are made at $46.50, to arrive, per flask of 75 lb. San Francisco, $46 and $43.50 for domestic and export orders, respectively. London price is £9 per flask, with £8 10s. quoted by second hands.

Our San Francisco correspondent writes, under date of May 10, that the quicksilver situation, following the dissolution of the Eureka company as a sales agency—which occurred in the last days of March—has not been satisfactory to the producers. There has been recently another rise and fall in the price, due directly to competition resulting from independent marketing and in part to other causes. That there is strong competition is undeniable, but it is apparently factional rather than individual. Settlement of the differences between the factions will probably be accomplished within the present month. The stocks in hand in the present week will not largely exceed 1000 flasks, and there is no present increase in production. The possibilities for future increase, though not numerous, are based upon prospects of finding new orebodies and the resumption of extraction and treatment at mines that have been idle for some time. The Guadalupe and the Idria are the chief producers; the Great Western is not producing; the Helen has resumed production; the Almaden is diligently seeking new orebodies; El Dinero prospect is pushing development; the Sierra Morena—formerly the Klau—is getting in shape for active production this summer. The successful settlement of factional competition by June 1, which is expected, will encourage production and should steady the market.

Bismuth—The current price of bismuth in London is 7s. 6d.—or $1.80—per pound.

Cadmium—The price in Germany is now, for metal 99½ per cent. pure, 700@750 marks per 100 kg.—equal to 78.27c. per lb., average.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@50c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

German Metal Trade

Imports and exports of metals other than iron, in the German Empire, for the year ended Dec. 31, were, in metric tons:

	Imports.	Exports.	Excess.	
Copper	200,774	81,621	Imp.	119,153
Copper, 1909	171,582	67,660	Imp.	103,922
Tin	14,469	10,252	Imp.	4,217
Tin, 1909	13,700	7,930	Imp.	5,770
Lead	81,851	45,035	Imp.	36,816
Lead, 1909	77,294	42,675	Imp.	34,619
Zinc	41,633	118,879	Exp.	77,246
Zinc, 1909	47,263	104,382	Exp.	57,119
Nickel	4,693	1,688	Imp.	3,005
Nickel, 1909	3,822	1,949	Imp.	1,873
Aluminum	9,980	2,373	Imp.	7,607
Aluminum, '09	8,679	1,768	Imp.	6,911
Miscellaneous	1,519	13,294	Exp.	11,775
Miscellan's, '09	1,191	11,285	Exp.	10,094

The figures include alloys and manufactures of the different metals. The imports and exports of ores for the year were, in metric tons:

Ores:	Imports.	Exports.	Excess.	
Gold ore	139	1	Imp.	138
Gold ore, 1909	177	.....	Imp.	177
Silver ore	2,091	.....	Imp.	2,091
Silver ore, '09	1,578	.....	Imp.	1,578
Copper ore	22,194	23,751	Exp.	1,557
Copper ore, '09	26,488	22,437	Imp.	4,051
Tin ore	17,343	73	Imp.	17,270
Tin ore, 1909	15,423	182	Imp.	15,241
Lead ore	112,151	2,382	Imp.	109,769
Lead ore, 1909	111,017	2,556	Imp.	108,461
Zinc ore	240,584	59,440	Imp.	181,144
Zinc ore, 1909	201,110	51,994	Imp.	149,116
Nickel ore	9,937	.....	Imp.	9,937
Nickel ore, '09	10,186	.....	Imp.	10,186
Chrome ore	24,470	386	Imp.	24,084
Chrome ore, '09	22 018	5,023	Imp.	16,995
Pyrites	792,735	9,871	Imp.	782,864
Pyrites, 1909	691,213	11,564	Imp.	679,649
Miscellaneous	5,468	792	Imp.	4,676
Miscellan's, '09	6,058	604	Imp.	5,454

Miscellaneous ores include tungsten, molybdenum and ores of other rare metals. Imports of slags and slag products in 1910 were 761,320 tons and exports, 58,832; an increase, as compared with 1909, of 268,549 tons in imports, but a decrease of 2842 tons in exports.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, three months ended March 31, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports	Exports	Excess	
Copper, long tons	44,876	20,240	Imp.	24,636
Copper, 1910	44,377	15,909	Imp.	28,468
Tin, long tons	10,786	12,948	Exp.	2,162
Tin, 1910	11,655	10,956	Imp.	699
Lead, long tons	52,897	9,472	Imp.	43,425
Lead, 1910	51,962	11,899	Imp.	40,063
Spelter, l'g tons	31,129	2,463	Imp.	28,666
Spelter, 1910	32,665	2,352	Imp.	30,313
Quicksilver, lb.	547,264	962,078	Exp.	414,814
Quicksilver, '10	1,311,792	243,177	Imp.	1,068,615
Minor met's, tons	1,440	4,848	Exp.	3,408
Minor, 1910	1,199	6,484	Exp.	5,285
Ores:				
Tin ore and con.	7,433	.....	Imp.	7,433
Tin ore, 1910	6,021	.....	Imp.	6,022
Pyrites	256,022	.....	Imp.	256,021
Pyrites, 1910	203,142	.....	Imp.	203,142

Copper totals include metallic contents of ore and matte. Exports include reexports of foreign material. Miscellaneous metals include nickel, aluminum and the minor metals and alloys. Of the imports in 1911, the United States furnished in all 14,244 tons fine copper, and 9291 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., May 13—The highest price paid this week for zinc ore was $40; the base price was $39@40 per ton of 60 per cent. zinc. The base price paid for 80-per cent. lead ore was $54 per ton.

SHIPMENTS, WEEK ENDED MAY 13

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	793,850	.....	.....
Platteville	735,310	.....	308,100
Galena	643,300	.....	.....
Hazel Green	326,730	.....	.....
Benton	172,000	.....	.....
Livingston	149,000	.....	.....
Highland	126,600	60,000	.....
Harker	88,500	.....	.....
Linden	82,700	.....	80,000
Rewey	62,000	.....	.....
Cuba City	.....	.....	176,000
Total	3,179,990	60,000	564,100
Year to date	50,578,750	2,923,595	12,907,930

Shipped during week to separating plants, 2,713,520 lb. zinc ore.

Joplin, Mo., May 13—The highest price paid for zinc sulphide ore was $43, the base ranging from $36 to $40.50 per ton of 60 per cent. zinc. Zinc silicate sold at $19@21 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $37.62. The highest price paid for lead ore was $56, offerings of buyers dropping to $54 at the week-end for best grades. The average price, all grades of lead, was $55.24 per ton.

The continued low price of zinc ore is driving many of the sheet-ground mine operators into the free-ore areas with prospecting and developing outfits, and as a consequence mining conditions are changing. Operators are directing their

attention to the new area between Joplin and Carl Junction, to the Carthage, Sarcoxie, Neck City, Spring City and Jackson points. The area northwest of Joplin, called the Toms station, and southwest, known as Jackson station, are the two more important factors, with some of the other camps making favorable showings.

SHIPMENTS, WEEK ENDED MAY 13

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,226,340	.....	815,530	$102,948
Joplin	3,042,670	.....	254,720	66,210
Alba-Neck	1,165,450	.....	53,690	25,344
Galena	916,850	.....	104,630	19,787
Oronogo	607,940	.....	.....	12,473
Duenweg	436,950	58,030	.....	8,998
Miami	358,270	.....	86,190	8,059
Granby	76,470	371,860	36,110	6,850
Carthage	302,070	.....	13,200	6,095
Carl Junction	254,370	.....	.....	5,087
Spring City	113,700	144,260	29,540	4,550
Aurora	130,420	58,970	.....	3,031
Jackson	139,150	.....	14,650	2,969
Badger	111,290	.....	.....	2,058
Cave Springs	62,490	.....	.....	1,124
Totals	11,944,430	633,120	1,408,260	$275,583
19 weeks	186,194,630	12,104,320	32,205,370	$4,723,978
Blende val., the week,	$229,388;	19 wks.,		$3,684,426
Calamine, the week,	7,305;	19 wks.,		142,578
Lead value, the week,	38,898;	19 wks.,		896,974

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1910	1911	1910	1911	1910	1911
January	$47.31	$41.85	$45.16	$40.55	$56.99	$55 68
February	40.69	40 21	39.47	39.16	53.64	54 46
March	43.60	39.85	39.71	38.45	51.26	54.77
April	41.00	38 88	39.33	37.47	49.72	56.37
May	40.19	.....	37 51	.....	48.16	.....
June	40.20	.....	37.83	.....	48.80	.....
July	39.63	.....	36.80	.....	48.59	.....
August	40.13	.....	37.32	.....	49.75	.....
September	43.45	.....	39.96	.....	54.73	.....
October	43 31	.....	40.50	.....	53.18	.....
November	47 20	.....	43 20	.....	54 80	.....
December	42 50	.....	40 70	.....	55.70	.....
Year	$42 43	.....	$39.79	.....	$52 12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, May 17—The general markets show no change and are devoid of special interest, except in a few cases.

Copper Sulphate—Demand is fair and spot supplies are again scanty. Quotations are firm, $4.50 per 100 lb. being named for carload lots, with higher prices where quick delivery is wanted.

Arsenic—Dullness in this article seems to be insistent and sales are few. Prices are about the same, $1.75 per 100 lb. being asked for white arsenic.

Sulphate of Ammonia—The German Ammonia Selling Union estimates the production of sulphate of ammonia in 1910 as follows: Germany, 373,000; Great Britain, 369,000; United States, 116,000; France, 56,000; Belgium, 43,000; other countries, 100,000; total, 1,057,000 metric tons.

Nitrate of Soda—Business is on a fair scale and prices are unchanged, 2.12½c. per lb. being quoted for spot and 2.10c. for future positions.

Petroleum

Exports of mineral oils from the United States, four months ended April 30, in gallons:

	1910	1911
Crude petroleum	38,642,824	39,035,810
Naphthas	25,132,346	26,357,574
Illuminating oils	294,651,354	343,667,650
Lubricating and paraffin	48,540,007	59,901,841
Residuum	33,956,101	44,041,361
Total	440,922,632	513,004,236

The total increase this year was 72,081,604 gal., or 16.3 per cent.

MINING·STOCKS

New York, May 17—The long expected decision of the Supreme Court in the Standard Oil case was made public on Monday, after the close of the Exchange. While it confirms the ruling of the lower courts against the company, there were some slight modifications which were considered by many as favoring the company in some degree. The immediate effect on the stock market was an advance in prices and a great increase in activity, chiefly due to the removal of the suspense which has been hanging over the market.

The Curb market has been a little more active, with prices inclined to be firmer. The Cobalt stocks were active, McKinley-Darragh being the principal feature. Porcupine Central made a fair showing in sales. The copper stocks were traded in to some extent, Braden, Greene-Cananea and Giroux being the leaders.

A small sale of Homestake was reported during the week, 10 shares at $84 per share.

Sales at auction in New York, May 11, included 400 shares Tramps Consolidated Mining Company, $1 par, $8 for the lot; 1730 shares Batopilas Mining Company, $20 par, $1.46 per share; $2000 Commercial Mining and Milling Company 6 per cent bonds, $1740 for the lot.

Boston, May 16—The handing down of the Supreme Court decision on the Standard Oil case has given coppers a period of activity and strength. The financial atmosphere has been greatly clarified.

Notwithstanding the low quotations for the metal, copper shares have maintained a degree of strength right along. Arizona Commercial has been conspicuously strong as have North Butte, Old Dominion and Superior & Boston. In today's excitement Arizona Commercial rose to $17.50, an advance of $2 during the week. North Butte is up $2, also, to $29.62½ and Old Dominion is up $3.50 to $42.50 per share.

Calumet & Hecla reached its low mark for a long period at $455. Its subsidiary stocks have been neglected, although maintaining a steady tone. Inspiration,

COPPER PRODUCTION REPORTS

Copper contents of blister copper, in pounds

Company	February	March	April
Anaconda	20,900,000	21,900,000	21,500,000
Arizona, Ltd	2,860,000	3,094,000	2,840,000
Balaklala	676,605	866,670	.....
Copper Queen	7,114,278	7,333,629	6,933,422
Calumet & Ariz	1,762,000	1,960,000	3,850,000
Detroit	1,918,365	1,914,710	1,814,740
East Butte	1,065,000	1,120,000	.....
Imperial	.....	.....	.....
Nevada Con	4,992,553	5,932,259	.....
Old Dominion	1,890,000	2,563,000	2,535,000
Shannon	1,166,000	1,322,000	1,258,000
South Utah	318,410	300,007	300,137
Superior & Pitts	1,808,000	2,540,000	.....
United Verde*	2,800,000	3,000,000	2,500,000
Utah Copper Co	7,329,326	7,260,267	.....
Lake Superior*	17,750,000	20,000,000	16,000,000
Non-rep. mines*	12,281,590	12,224,993	11,825,000
Total production	86,032,127	93,331,535	.....
Imports, bars, etc.	23,935,222	24,345,814	.....
Total blister	109,967,349	117,677,349	.....
Imp. in ore & matte	5,981,487	6,126,650	.....
Total	115,948,836	123,803,999	.....
Brit. Col. Cos.:			
British Col. Copper	767,470	804,542	.....
Granby	1,633,300	1,988,341	.....
Mexican Cos.:			
Boleo	2,226,560	2,700,880	2,403,520
Cananea	3,906,000	3,542,000	3,644,000
Moctezuma	1,950,475	2,049,150	2,315,292
Exports from:			
Chile	5,488,000	9,408,000	.....
Australia	2,744,000	4,816,000	.....

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries, for Export
IV, 1910	117,477,639	67,985,951	31,332,434
V	123,242,476	59,305,222	45,495,400
VI	127,219,188	53,363,196	65,895,948
VII	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424,316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II	109,828,297	50,518,998	45,111,019
III	130,532,080	66,080,789	59,081,127
IV	118,085,223	52,407,650	62,129,599

	Visible Stocks.		
	United States.	Europe.	Total.
V, 1910	141,984,159	246,870,400	388,854,559
VI	160,425,973	239,142,400	399,568,373
VII	168,386,017	232,892,800	401,278,818
VIII	170,640,678	222,320,000	392,960,677
IX	168,881,245	218,444,800	387,326,045
X	148,793,714	211,276,800	360,070,514
XI	139,261,914	198,060,800	337,322,714
XII	130,389,069	193,200,000	323,589,069
I, 1911	122,030,195	236,629,120	358,649,315
II	142,439,490	236,992,000	379,431,190
III	156,637,770	233,385,600	390,023,370
IV	162,007,934	223,014,400	385,022,334
V	165,555,908	212,284,800	377,840,708

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. From Jan. 1, 1911, stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

Mason Valley and Ray Consolidated showed point or so advances with considerable pool activity noticeable.

Curb trading has been of small proportions. The feature has been the continued selling of Rhode Island Coal, which has driven the price to below $2 per share.

Assessments

Company	Delinq	Sale	Amt
Alpha Con., Nev.	May 9	May 31	$0.05
Andes, Cal.	May 2	May 23	0.10
Amer. M. Co., Ida.	May 6	May 27	0.001
Best & Belcher, Nev	May 17	June 6	0.10
Bonanza Mountain, Ida.	Apr. 28	May 27	0.001
Challenge, Cal.	Apr. 26	May 27	0.05
Confidence, Nev.	May 11	May 31	0.20
Davis-Daly, Mont.		June 7	0.50
East Hercules Extens'n, Id.	June 19	July 19	0.001
Ely Consolidated, Nev.	May 2	June 22	0.05
Gold Mt. Champion, Utah.	May 20	June 7	0.01
Gould & Curry, Nev.	May 12	June 1	0.10
Mountain Dell, Utah.	May 31	June 16	0.02
North Star, Ida.	May 15	June 15	0.001
Overman, Nev	May 17	June 7	0.05
Potosi, Nev.	May 8	May 31	0.10
Reindeer, Ida.	June 1	July 1	0.005
Scorpion, Nev.	May 4	May 24	0.03
Seven Troughs, Nev.	May 15	June 2	0.0025
Sierra Nevada, Nev.	May 4	May 25	0.10
Silver Shield, Utah.	May 16	June 3	0.015
Smuggler, Utah	May 20	June 20	0.005
Swansea Consolidated, Utah	May 15	June 7	0.01
Utah-Arizona, Ariz.	May 20	May 31	0.005
Utah Consolidated, Utah.	May 20	June 10	0.01
Yellow Jacket, Nev	May 8	June 8	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.			London.		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	52.222	23.706	23.794	24.081
March	50.468	51.454	52.745	23.227	23.690	24.324
April	51.428	53.221	53.325	23.708	24.483	24.595
May	52.905	53.870		24.343	24.797	
June	52.538	53.462		24.166	24.651	
July	51.043	54.150		23.519	25.034	
August	51.125	52.912		23.588	24.428	
September	51.440	53.295		23.743	24.567	
October	50.923	55.490		23.502	25.596	
November	50.703	55.635		23.351	25.680	
December	52.226	54.428		24.030	25.160	
Total	51.502	53.486		23.706	24.670	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York.				London, Standard.	
	Electrolytic		Lake.			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12.611	59.388	54.970
March	13.255	12.139	13.586	12.447	59.214	54.704
April	12.733	12.019	13.091	12.275	57.238	54.035
May	12.550		12.885		56.313	
June	12.404		12.798		55.310	
July	12.215		12.570		54.194	
August	12.490		12.715		55.733	
September	12.379		12.668		55.207	
October	12.553		12.788		56.722	
November	12.742		12.914		57.634	
December	12.581		12.863		56.769	
Year	12.738		13.039		57.054	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

TIN AT NEW YORK

Month.	1910.	1911.	Month.	1910.	1911.
January	32.700	41.255	July	32.695	
February	32.920	41.614	August	33.972	
March	32.463	40.157	September	34.982	
April	32.976	42.185	October	36.190	
May	33.125		November	36.547	
June	32.769		December	38.199	
			Av. Year	34.123	

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459	4.394	4.307	4.238	13.063	13.122
April	4.376	4.412	4.225	4.262	12.641	12.889
May	4.315		4.164		12.550	
June	4.343		4.207		12.688	
July	4.404		4.291		12.531	
August	4.400		4.290		12.513	
September	4.400		4.289		12.582	
October	4.400		4.271		13.091	
November	4.442		4.314		13.217	
December	4.500		4.363		13.197	
Year	4.446		4.312		12.920	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	5.518	5.419	5.368	23.188	23.276
March	5.637	5.563	5.487	5.413	23.031	23.016
April	5.439	5.399	5.289	5.249	22.469	23.743
May	5.191		5.041		22.100	
June	5.128		4.978		22.094	
July	5.152		5.002		22.406	
August	5.279		5.129		22.800	
September	5.514		5.364		23.165	
October	5.628		5.478		23.900	
November	5.976		5.826		24.083	
December	5.624		5.474		24.019	
Year	5.520		5.370		23.050	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	$19.90	$15.90	$17.98	$14.40	$17.94	$14.75
February	18.96	15.90	17.21	14.50	17.38	14.81
March	18.53	15.90	16.93	14.65	17.00	14.96
April	18.28	15.90	16.84	14.65	16.75	15.00
May	17.10		15.94		16.18	
June	16.52		15.60		15.53	
July	16.40		15.40		15.40	
August	16.09		14.89		15.16	
September	15.92		14.73		14.93	
October	15.90		14.05		14.88	
November	15.84		14.26		14.78	
December	15.90		14.15		14.65	
Year	$17.10		$15.65		$15.83	

STOCK QUOTATIONS

COLO. SPRINGS May 16

Name of Comp.	Bid.
Acacia	.03
Cripple Cr'k Con.	.01½
C. K. & N.	‡ 14
Doctor Jack Pot	.05½
Elkton Con.	.53
El Paso	.57
Findlay	.03
Gold Dollar	‡ .10½
Gold Sovereign	.02
Isabella	.10½
Jack Pot	‡ .05
Jennie Sample	.08
Lexington	‡ 01
Moon Anchor	.02½
Old Gold	‡ 03
Mary McKinney	.32½
Pharmacist	.01
Portland	.96
Vindicator	.75
Work	.02

SALT LAKE May 16

Name of Comp.	Bid.
Beck Tunnel	.23
Black Jack	.13½
Carisa	.15
Cedar Talisman	.06½
Colorado Mining	.51
Columbus Con.	.36
Daly Judge	‡4.45
Grand Central	.70
Iron Blossom	1 17½
Little Bell	.35
Lower Mammoth	.11
Mason Valley	8
May Day	15
Nevada Hills	2.95
New York	‡.13
Prince Con	.45
Silver King Coal'n	1.65
Sioux Con.	.33
Uncle Sam	.70
Yankee	‡ 15

TORONTO May 16

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	6.75	Dome Exten.	57¼
Hudson Bay	.90	Pearl Lake	.53
Temiskaming	.70	Dobie	3.60
Wettlaufer-Lor.	.96	West Dome	2.52
Hollinger	11.85	Standard	.19
Preston E. D.	.35½	Apex	.16
Porcu. Gold	.64½	Canada	1.12
Porcu. Tisdale	.11½	Crown Char.	‡ .52
Imperial	.15	Coronation	.38½
Central	.73	Swastika	.54½

SAN FRANCISCO. May 16.

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.07	Belmont	6.20
Belcher	.78	Jim Butler	.25
Best & Belcher	.58	MacNamara	.12
Caledonia	.40	Midway	.20
Challenge Con.	.21	Mont.-Tonopah	.80
Chollar	.30	North Star	.15
Confidence	.95	West End Con.	.54
Con. Virginia	1.47½	Atlanta	.10
Crown Point	.75	Booth	.08
Gould & Curry	.28	C.O.D. Con	.08
Hale & Norcross	.30	Comb. Frac	.07
Mexican	4.25	Jumbo Extension	.25
Occidental	.65	Oro	.04
Ophir	1.97½	Silver Pick	.04
Overman	.45	St. Ives	‡.16
Potosi	.44	Tramps Con.	‡.02
Savage	.38	Argonaut	‡1.70
Sierra Nevada	.53	Bunker Hill	‡7.12
Union Con.	1.47½	Cent. Eureka	1.25
Yellow Jacket	.72	So. Eureka	‡7.50

N. Y. EXCH. May 16

Name of Comp.	Clg.
Amalgamated	64¾
Am. Agri. Chem.	58⅞
Am. Sm. & Ref., com	77⅜
Am. Sm. & Ref., pf.	105
Anaconda	37⅝
Batopilas Min.	‡2
Bethlehem Steel pf	62
Chino	24½
Comstock Tunnel	.29
Federal M. & S., pf.	65
Goldfield Con	5⅜
Great Nor., ore ctf.	61⅜
Homestake	84
Miami Copper	19¾
Nat'nal Lead, com.	53¾
National Lead, pf.	108¾
Nev. Consol	18⅞
Pittsburg Coal, pf.	79½
Ray Con.	18
Republic I. & S., com	30½
Republic I & S, pf.	95
Sloss-Sheffi'd, com.	50
Sloss Sheffield, pf.	‡112
Tennessee Copper	37½
Utah Copper	47
U. S. Steel, com.	78⅞
U. S. Steel, pf.	119⅜
Va. Car. Chem.	61

N. Y. CURB May 16

Name of Comp.	Clg.
Ariz.-Cananea	‡3⅜
Barnes King	‡.15
Braden Copper	4⅝
B. C. Copper	5⅛
Buffalo Mines	2.05
Butte Coalition	18¼
Calumet & Mont.	‡.20
Cobalt Central	.04
Con. Ariz. Sm.	1⅜
Davis-Daly	1¼
Ely Con.	½
Florence	1½
Giroux	6
Greene Cananea	6¼
Greenwater	‡.06
Guanajuato	‡3¼
Guerrero	‡1⅛
Guggen. Exp.	195
Inspiration	9
Internat. S. & R.	‡124
Kerr Lake	6⅜
La Rose	4⅝
McKinley-Dar-Sa.	11⅛
Min. Co. of A. new	5⅛
Moneta Porc.	‡.23
Mont. Shoshone	‡.04
Nev. Utah M. & S.	⅛
Nipissing Mines	10¾
Ohio Copper	1⅜
Pacific Sm. & M.	⅛
Precious Metals	⅛
Ray Central	1¾
Red Warrior	‡1½
South Utah M. & S.	⅛
Standard Oil	665
Stewart	1¼
Tonopah	6
Tonopah Ex.	1
Tri-Bullion	¾
Tularosa	‡⅛
Union Mines	‡¼
Yukon Gold	3⅛

LONDON May 17

Name of Com.	Clg.
Camp Bird	£1 12s 0d
Dolores	1 10 0
El Oro	1 4 6
Esperanza	1 11 3
Mexico Mines	6 1 3
Oroville	0 6 3
Stratton's Ind.	0 2 3
Tomboy	0 15 0

BOSTON EXCH. May 16

Name of Comp.	Clg.
Adventure	5¾
Algomah	7¼
Allouez	32
Am. Zinc	26¾
Arcadian	3½
Arizona Com.	17⅜
Atlantic	5⅛
Bonanza	50
Boston & Corbin	13¼
Butte & Balak	6¼
Calumet & Ariz.	51½
Calumet & Hecla	460
Centennial	11½
Con. Mercur	‡.05
Copper Range	60¾
Daly-West	6¼
East Butte	11¾
Franklin	10⅜
Granby	34
Hancock	23½
Hedley Gold	‡15
Helvetia	1¼
Indiana	12½
Isle Royale	14
Keweenaw	2¾
Lake	34¼
La Salle	3½
Mass	6⅛
Michigan	2
Mohawk	40
New Arcadian	67⅞
North Butte	29¼
North Lake	7
Ojibway	6¼
Old Dominion	42½
Osceola	100
Parrot	11¼
Quincy	68
Shannon	10¾
Shattuck-Ariz.	‡18½
Superior	33¼
Superior & Bost.	5½
Superior & Pitts.	14¼
Tamarack	35
Trinity	3¾
U. S. Smelting	34½
U. S. Smelt'g, pf.	46¾
Utah Apex	2½
Utah Con.	15
Victoria	1¾
Winona	6¾
Wolverine	108
Wyandot	1⅜

BOSTON CURB May 16

Name of Comp.	Last
Ahmeek	160
Bingham Mines	1½
Boston Ely	1⅛
Boswyocolo	.08
Cactus	.12
Calaveras	1⅞
Champion	‡.01
Chief Cons	1⅞
Corbin	3
Cortez	1½
Crown Reserve	3⅛
First Nat. Cop.	1½
Live Oak	18½
Mackinaw	‡.02
Majestic	.44
Nat'l Mine & Ex.	.01
Nevada-Douglas	2
Oneco	1½
Raven Copper	.21
Rhode Island Coal	1⅛
San Antonio	‡3½
South Lake	5½
Trethewey	1⅛
Tuolumne Copper	4⅜
United Zinc, pfd.	‡2
Vulture	5
Yuma	‡.02

‡Last quotation.